BUFFALO MILL EXHAUSTERS

With Practical Data on Blow Pipe Systems

Catalog No. 258

BUFFALO FORGE COMPANY
Buffalo, N. Y.

BUFFALO EXHAUST FANS

For the Removal of Shavings, Sawdust and Emery Dust; Elevation of Cotton, Wool and Grains; Removal of Smoke and Fumes; and Allied Uses

WITH

Practical Engineering Data

and

Extracts of State Laws

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

NEW YORK PHILADELPHIA PITTSBURG CINCINNATI
DETROIT CHICAGO ST. LOUIS DENVER
LOS ANGELES CHARLOTTE, N. C.

Canadian Factory and Main Office

CANADIAN BUFFALO FORGE CO., Limited

MONTREAL

ST. JOHN TORONTO WINNIPEG VANCOUVER

A Word in Confidence

FAN engineering is the most intangible branch of the engineering profession. To the uninitiated the paths are uncharted and authentic data is difficult to obtain. So many variables enter into the design of this apparatus and the layout of installations that commendable results and high efficiency are only the outcome of the most careful and extensive research.

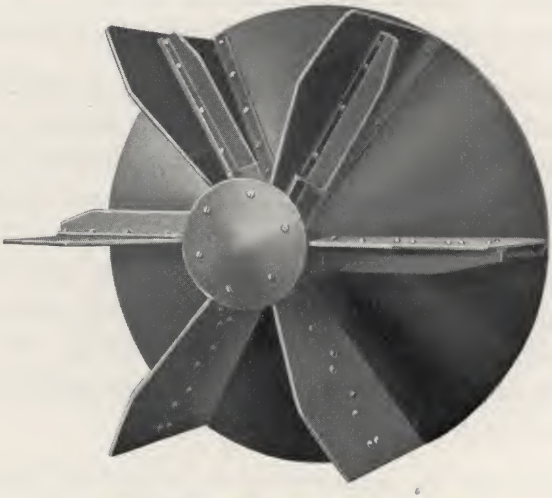
The very best fan experts of this country, the men whose word is final in the engineering world, are on our engineering staff. We are ever leaders in high efficiency design coupled with practicability.

Investigate the exhaust fans described in this catalog. Note the rigidity and simplicity shown in every line of construction. Housings adjustable to any direction of discharge, ring-oiling and self-aligning bearings, blast wheels of substantial construction to withstand the severe service imposed, and maximum efficiency of operation resulting from proper proportioning, are especially commendable.

Our slow speed, high efficiency exhaust fan is something more than a name. A larger blast wheel in a regular housing was not our method of procedure. On the Buffalo Slow Speed design proportions and construction of housing, wheel blades, inlet and outlet were all carefully worked out in harmony. Thus a distinctly new type of fan was evolved. The results were gratifying and we point with pride to this equipment. Fifteen to fifty per cent better power economy, and thirty-five per cent reduction in speed, with the attendant reduction in wear and tear, without in any way sacrificing serviceability, are features hard to overlook.

We trust that the engineering data incorporated may prove of value and wish to assure you that your confidence bestowed upon our equipment will never be regretted.

Standard Blast Wheel for Buffalo Steel Plate Mill Exhauster.

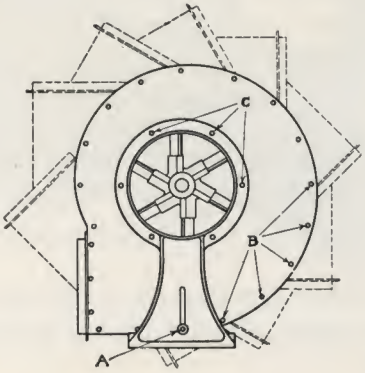


Blast Wheel for Stringy Material.

Buffalo Standard Reversible Steel Plate Mill Exhausters

THESE exhausters have reversible housings, adjustable to either hand and to any direction of discharge. All adjustments are made in a few minutes and on the outside of the housing.

To change the direction of discharge, it is only necessary to loosen the hook bolts "C" in the ring of each pedestal and take out bolt "A", then revolve the housing until the discharge points in the desired direction. To change the hand, remove these hook bolts "C," loosen set screws holding the blast wheel to shaft, then shift the pedestals.



The advantages are self evident. One fan may be used to meet any requirement, eliminating the necessity for crossed belts and avoiding all sharp angles. To the mill owner, this is desirable because it is frequently necessary to change the position of the fan due to alterations or enlargement of the piping and building. The fan can quickly be adjusted to the new position and meets the requirements like a fan built for the place. To the dealer, this is desirable as it is not necessary to carry in stock fans of each hand and angle of discharge.

Construction

Heavy rolled steel plate, securely bolted together with angle irons, is used in the construction of the housing. A round cast iron outlet is bolted to the housing.

The blast wheel is mounted upon a heavy cast iron spider or hub. The spokes to which the vanes or blades of the fan are securely riveted are of tee steel, cast into the hub, insuring strength and rigidity. The heavy steel plate blades are not only riveted to the spokes, but also to the heavy steel plate side flanges.

In special cases, when heavy, bulky or abrasive material is to be handled, extra heavy blast wheels are furnished. Our engineers will gladly make the proper recommendations.

Cotton, wool, and other textiles as well as spent tan bark in tanneries and long stringy shavings in planing mills require a wheel in which the material passing through the exhauster will not be caught. A cone blast wheel constructed with a heavy back plate and without any front flange is furnished for such materials.

Every wheel is balanced by our special method which insures smooth running and absence of vibration. A running test is made upon each fan at speeds far beyond those required in practice.

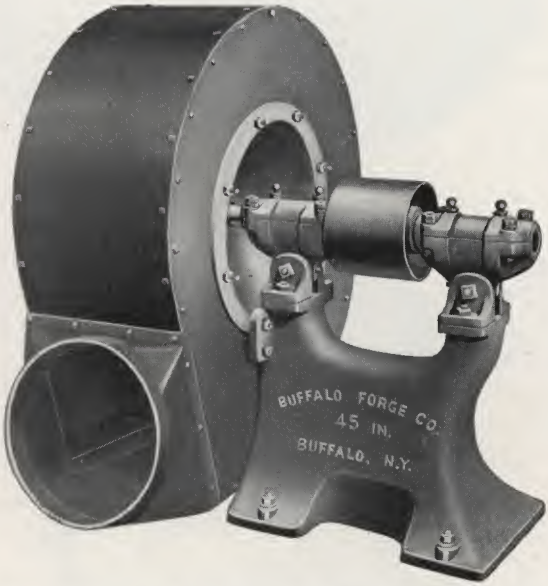
The blast wheel is overhung on a shaft of hardened steel so that the material passing through the fan does not come in contact with the bearings.

Standard Self-Aligning Oil-Ring Bearings

Buffalo double oil-ring and self-aligning bearings have given extreme satisfaction for many years.

The journal, five diameters in length and lined with the best white metal, has two chambers for the oil rings. These rings constantly carry oil to the shaft. It is impossible for the bearings to be without lubrication as long as there is oil in the chambers.

The rings operate perfectly quiet until the oil becomes low. Any noise, therefore, is a signal for re-oiling.

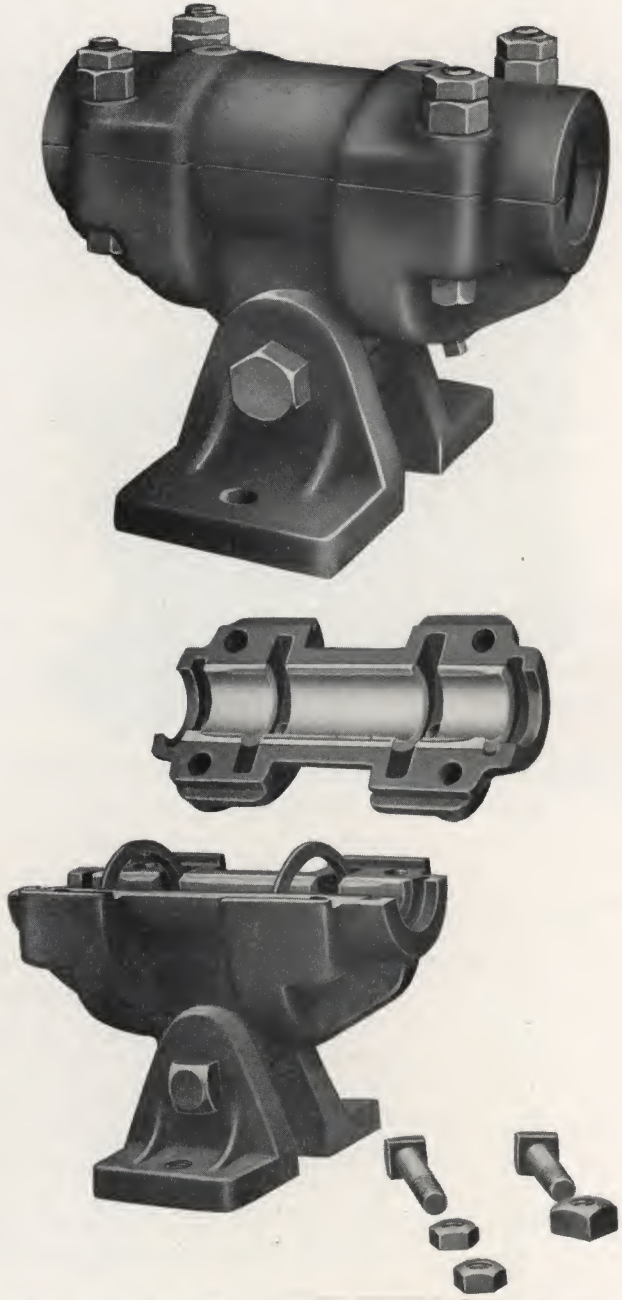


Buffalo Standard Reversible Steel Plate Mill Exhausters.
Right Hand Bottom Horizontal Discharge.

SPECIFICATIONS.

Size	Outside Diameter of Inlet and Outlet	PULLEYS		Weight	Price of Single Fan
		Diameter	Face		
30	12	6	4½	300	**$ 55.00**
35	14	7	5½	365	**70.00**
40	16	8	6½	500	**90.00**
45	18	9	7½	675	**115.00**
50	20	10	8½	900	**150.00**
55	22	11	9½	1125	**185.00**
60	24	12	10½	1400	**200.00**
70	28	14	11½	1800	**250.00**
80	32	16	12½	2300	**300.00**

NOTE—See suggestions for ordering, page 37.



Details of Buffalo Self-Aligning Double Oil-Ring Bearings.

The bearings are self-aligning vertically and bolted to the pedestal in such a way that considerable adjustment is possible horizontally, making the bearings to all practical purposes self-aligning in both directions.

For the removal of gases and fumes from acids, and of smoke and gases from fires; also for handling gases at high temperatures, fans of special material and construction are often required. Recommendations and quotations will be promptly submitted when requested.

Buffalo Double Mill Exhausters

It is often advisable to use a double fan, since less head room is required and the piping system is simplified. By placing a double exhauster in a central position, and running independent pipes to each end of the room, bends are avoided and material to be moved has less distance to travel, reducing the amount of power required. The expense of installing a double exhauster is less than that of putting in two single fans. See illustrations on next page.

Buffalo Direct-Connected Mill Exhausters

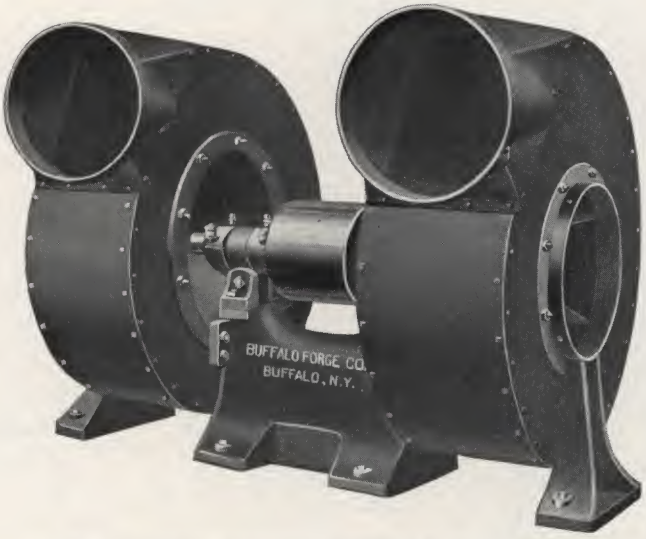
Buffalo direct connected outfits can often be used to advantage since belting is avoided and floor space economized. The motor is placed on a sheet steel sub-base rigidly attached to the housing, making a single complete unit, impossible to get out of alignment. These outfits may be mounted on platforms near the ceiling, a convenient location as it is desirable to keep the main discharge pipe close to the ceiling. In requesting quotations, give characteristics of electric current available.

Speed and Power Requirements

Single Standard Steel Plate Mill Exhausters with Different Area Suction Pipes and Varying Velocity.

NOTE. Tables are computed with 200 feet of suction and discharge piping and a collector. The diameter of main discharge pipe is in each instance assumed of same area as the fan outlet. For each additional 10 feet of suction or discharge piping, the speed should be increased approximately one per cent and the power will be increased approximately three per cent. If a collector and elbows are included in the system, the length of pipe to which they are equivalent must be added to the actual length, in order to determine the total equivalent operating length from which speed and power may be figured. (See pages 55 and 57 for further explanation). If the total operating length is less than 200 feet, the speed should be decreased approximately one per cent for each 10 feet and the power will be decreased approximately three per cent. For double fans, power and air handled will be doubled, speeds the same as single fans.

Exhauster			Suction Branches		VELOCITY THROUGH BRANCH SUCTION PIPES IN FEET PER MINUTE.																	
	Inlet and Outlet				2500			3000			3500			4000			4500			5000		
SIZE	Diameter	Area Sq. in.	Area Sq. in.	Equivalent Diameter	Cubic Feet per Minute	R. P. M	Brake H. P.	Cubic Feet per Minute	R. P. M.	Brake H. P.	Cubic Feet per Minute	R. P. M.	Brake H. P.	Cubic Feet per Minute	R. P. M.	Brake H. P.	Cubic Feet per Minute	R. P. M.	Brake H. P.	Cubic Feet per Minute	R. P. M.	Brake H. P.
			79	10	1362	1180	1.14	1635	1410	2.0	1910	1675	3.3	2180	1925	4.7	2450	2140	6.6	2720	2463	9.2
30	12	113	113	12	1965	1350	1.86	2360	1620	3.2	2750	1890	5.1	3150	2170	7.6	3540	2485	10.8	3940	2695	15.6
			154	14	2660	1625	3.43	3190	1940	5.6	3720	2240	9.2	4250	2552	13.5						
			113	12	1965	1020	1.5	2360	1185	2.5	2750	1390	4.0	3150	1570	6.0	3540	1775	8.4	3940	1970	11.7
35	14	154	154	14	2660	1110	2.28	3190	1350	3.9	3720	1570	6.2	4250	1780	9.3	4790	1990	13.1	5320	2350	18.1
			201	16	3490	1285	3.65	4200	1535	6.3	4890	1775	10.0	5540	2020	14.6	6280	2470	23.3			
			154	14	2660	842	1.81	3190	1018	3.1	3720	1185	5.0	4250	1350	7.4	4790	1520	10.6	5320	1750	14.5
40	16	201	201	16	3490	942	2.82	4200	1120	4.7	4890	1320	7.7	5540	1495	11.3	6280	1755	16.2	7000	1890	22.4
			254	18	4430	1085	4.42	5310	1295	7.5	6200	1530	12.4	7080	1730	18.1	7980	1970	25.8			
			201	16	3490	740	2.3	4200	908	3.9	4890	1030	6.2	5540	1170	9.2	6280	1320	13.1	7000	1400	18.1
45	18	254	254	18	4430	818	3.35	5310	973	5.6	6200	1140	9.1	7080	1295	13.3	7980	1458	19.2	8850	1615	26.4
			314	20	5450	903	4.9	6540	1090	8.4	7630	1370	13.4	8700	1450	19.2	9800	1640	28.2	10900	1810	39.0
			254	18	4430	646	2.8	5310	770	4.7	6200	905	7.4	7080	1028	11.0	7980	1160	15.8	8850	1285	21.5
50	20	314	314	20	5460	712	3.84	6550	863	6.6	7650	991	10.7	8730	1130	15.7	9820	1270	22.3	10900	1410	30.6
			380	22	6600	792	5.5	7920	942	9.5	9250	1110	15.2	10578	1260	22.2	11890	1410	31.8	13200	1600	44.4
			314	20	5460	590	3.4	6550	690	5.5	7650	810	8.8	8730	908	12.6	9820	1040	18.7	10900	1150	25.4
55	22	380	380	22	6600	632	4.63	7920	748	7.5	9250	878	12.5	10570	991	17.6	11890	1105	25.4	13200	1230	35.2
			452	24	7850	705	6.12	9450	840	10.6	11000	990	17.2	12550	1105	24.7	14150	1265	35.5	15750	1400	50.0
			380	22	6600	553	4.15	7920	630	6.4	9250	718	9.7	10570	832	15.3	11890	940	21.5	13200	1050	30.0
60	24	452	452	24	7850	560	4.8	9450	684	8.6	11000	808	13.8	12500	911	20.4	14150	1045	28.1	15750	1140	40.2
			531	26	9200	620	6.6	11050	738	11.1	12900	862	18.9	14700	955	24.6	16500	1100	38.0	18400	1240	52.2
			531	26	9200	434	4.85	11100	530	8.3	12900	622	13.4	14700	704	19.4	16500	795	27.8	18400	885	38.8
70	28	616	616	28	10650	467	5.92	12800	575	11.0	14950	670	18.3	17100	744	25.8	19200	858	36.6	21400	955	50.5
			707	30	12250	515	8.4	14700	620	14.3	17100	720	22.6	19600	820	33.2	22100	920	47.4	24500	1035	66.0
			707	30	12250	346	4.86	14700	460	10.5	17150	535	16.8	19600	607	24.9	22100	690	35.6	24500	765	49.2
80	32	804	804	32	13900	410	7.82	16700	485	13.2	19500	569	22.6	22200	645	31.2	25000	730	48.0	27700	811	61.8
			908	34	15750	437	9.9	18900	521	16.8	22100	611	26.7	25200	696	40.0	28300	789	57.5	31500	878	78.6



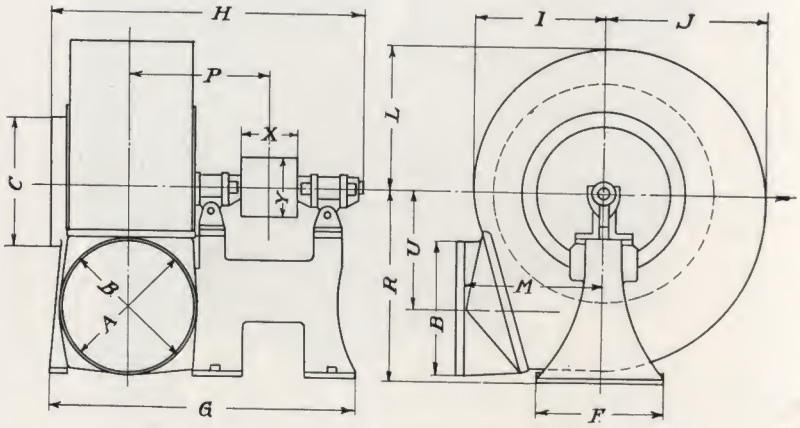
Buffalo Double Standard Reversible Mill Exhauster.
Top Horizontal Discharge.

SPECIFICATIONS.

Size	Outside Diameter of Inlets and Outlets	PULLEYS		Weight	Price of Double Fan.
		Diameter	Face		
30	12	6	6½	500	**$ 90.00**
35	14	7	7½	600	**100.00**
40	16	8	8½	750	**130.00**
45	18	10	9½	1000	**170.00**
50	20	12	10½	1350	**210.00**
55	22	13	11½	1725	**275.00**
60	24	14	12½	2100	**325.00**
70	28	16	14	2700	**400.00**
80	32	20	16	3000	**500.00**

NOTE—See suggestions for ordering, page 37.

Buffalo Standard Reversible Mill Exhauster

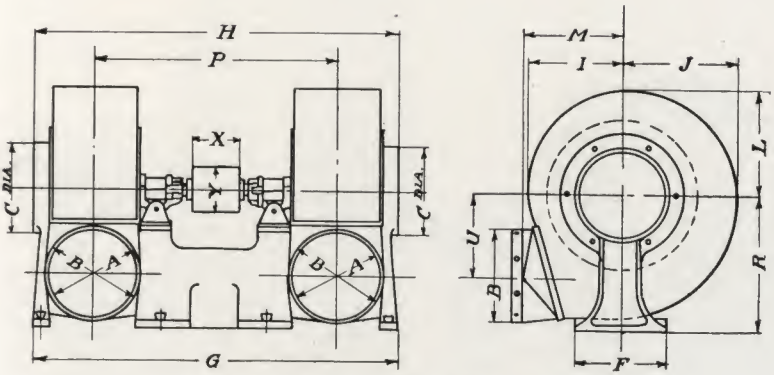


Right Hand Bottom Horizontal Discharge

DIMENSIONS IN INCHES.

SIZE	A	B	C	F	G	H	I	J	L	M	P	R	U	X	Y
30	11½	12	12	12	31¾	32⅞	12	15	13½	13	14⅜	18	11	4½	6
35	13½	14	14	13¾	35 9/16	35½	13⅞	17⅜	15⅝	15½	15⅝	20¾	12⅞	5½	7
40	15⅜	16	16	15¾	39	39¾	16	20	18	16⅞	17⅜	24	15	6½	8
45	17⅜	18	18	17½	42¾	44½	17⅞	22⅜	20½	19½	19½	26⅜	16⅜	7½	9
50	19⅜	20	20	19¾	46 5/16	47½	19¾	24½	22½	21¼	21	29¼	18½	8½	10
55	21½	22	22	21¼	50	51½	21⅜	27⅛	24⅜	23	23	32	20⅛	9½	11
60	23½	24	24	24	52⅜	54	23¾	29¾	26¾	25	24½	35	22½	10½	12
70	27½	28	28	24	60⅜	60½	27½	34½	31	28¾	27½	39½	25½	11½	14
80	31½	32	32	28	67½	65⅜	31½	39½	35½	32½	30½	45½	29½	12½	16

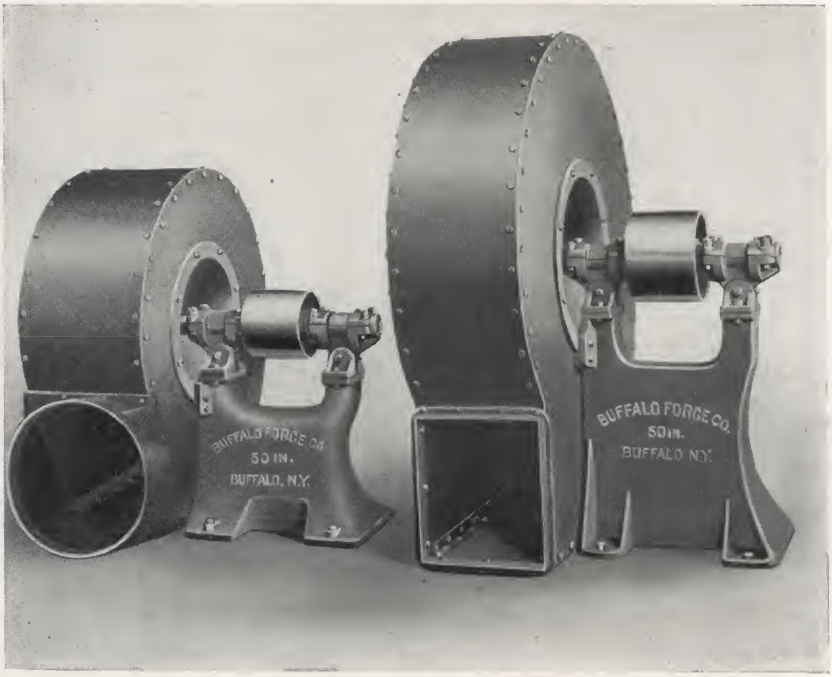
Buffalo Double Standard Reversible Mill Exhauster



Bottom Horizontal Discharge

DIMENSIONS IN INCHES.

SIZE	A	B	C	F	G	H	I	J	L	M	P	R	U	X	Y
30	11½	12	12	12	48¾	47⅛	12	15	13½	13	31⅛	18	11	6½	6
35	13½	14	14	13¾	53¼	52	13⅝	17⅛	15⅝	15⅛	34½	20¾	12⅝	7½	7
40	15⅜	16	16	15¾	59½	58¼	16	20	18	16⅞	38¼	24	15	8½	8
45	17⅜	18	18	17½	65½	64½	17⅝	22⅜	20⅛	19¼	42¼	26⅝	16⅜	9½	10
50	19⅜	20	20	19¾	71¾	70½	19¾	24¾	22¼	21¼	46½	29¼	18½	10½	12
55	21¼	22	22	21½	77⅛	75⅜	21⅜	27⅛	24⅜	23	49⅞	32	20⅛	11½	13
60	23¼	24	24	24	83¼	81½	23¾	29½	26¾	25	54½	35	22¼	12½	14
70	27¼	28	28	24	93¾	91½	27½	34½	31	28¾	60½	39½	25½	14	16
80	37¼	32	32	28	101¾	99½	31½	39½	35½	32½	65½	45½	29½	16	20



Standard Mill Exhauster. **Slow Speed, High Efficiency Exhauster.**

This cut illustrates the difference in size and design of the two types. Both are referred to as 50 inch fans, because the capacity is the same.

Buffalo Slow Speed, High Efficiency Mill Exhausters

IT is evident enough that all of the claims made for high efficiency mill exhausters cannot be true. Outside of the actual experience, nothing would be so apt to convince a customer as a truthful explanation of our claims for high efficiency.

Slow speed fans are no more efficient on account of the reduced speed, except in so far as they cause less slippage of belts. They do decrease the wear and tear and vibration, and in the long run would be a good investment even if the power required were the same.

Manufacturers who actually build a slow speed fan do not use a special wheel inside the regular housing, but use an entirely different design, and besides the reduction in speed they make some attempt to secure better efficiency by improvements in design.

It has long been recognized by fan builders, or at least by those who do any experimental work, that the ordinary proportions of mill exhausters are such as to give large capacity but not very high efficiency.

We believe, and our results show, that we have gone into this question more thoroughly than any other manufacturer, and that the Buffalo slow speed fan design is the best on the market.

Actual installation of Buffalo Slow Speed Exhausters show power savings from 15 to 50%. The former figure represents the difference in efficiency between this fan and the standard fans, and in the latter is included the additional saving due to improved layout of piping often effected by our engineering service.

To obtain this result the blast wheels are made of large diameter and comparatively narrow width; the inlets are small in proportion to the size of the housing; for instance our 50-inch slow speed fan has the same size inlet pipe as the ordinary 50-inch trade fan, but the housing is actually about 70 inch high. The horsepower and speeds are as given in the table on page 21, the values in which are very conservative.

Front and Back view of Buffalo Slow Speed, High Efficiency Exhauster.
Right Hand Up Blast Discharge.

In spite of the higher cost, we have found a very satisfactory market for these slow speed fans. Increase in cost of power naturally leads manufacturers to consider the use of machinery having greater refinements in construction, and we have anticipated this demand.

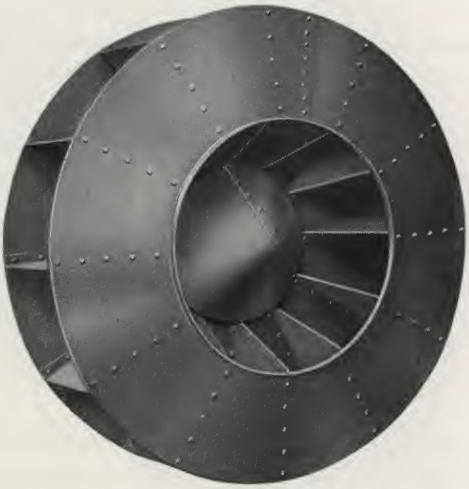
It is often possible to re-arrange an exhaust system so as to take less power even though the fans are not changed, but we have in many cases installed our slow speed fans in place of old style fans, making considerable reduction in power, although no other part of the system was changed in any respect. Further particulars on these installations will be given on request.

Construction

The same general features of construction that make our standard exhaust fans so serviceable are incorporated in the Buffalo slow speed fans, namely, housings adjustable to any direction of discharge, double oil-ring and self-aligning bearings, and the liberal use of the best materials of construction, so essential to a high class machine.

The blast wheel is designed and built to last as long as the fan. A heavy back plate is the foundation upon which are riveted the twelve blades. A steel plate front flange, securely riveted to the blades, completes the general construction. The blades are very wide at the back, giving a long riveting flange. This design also helps to make the material pass through the fan without any abrupt change of direction and reduces eddy currents at the back. A smooth heavy steel plate cone aids in this gradual deflection.

When conveying stringy material, such as long shavings, bark, cotton and similar materials, the blast wheel must be of a design which will prevent clogging. For such materials we furnish a wheel which has proven very successful. The construction is extra heavy to withstand the severe conditions encountered. The front flange is omitted, and the vanes are spaced further apart.



Buffalo Slow Speed, High Efficiency Blast Wheel.

Buffalo Slow Speed Blast Wheel for Stringy Material.

When refuse from barkers or similar material is to be handled, a still heavier construction is essential. The proper apparatus will always be furnished upon receipt of full details about the requirements.

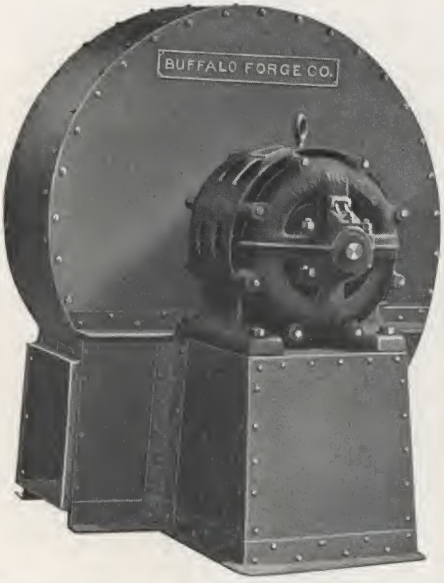
In all Buffalo slow speed exhausters the material does not come in contact with the back side sheet of the fan housing, which greatly increases the life of the fan.

Buffalo High Efficiency Direct-Connected Exhausters.

Electric driven direct-connected slow speed exhausters are highly recommended. Belting is avoided, floor space economized, and wear and tear reduced to a minimum.

The first cost of such a unit is more than for an ordinary fan, but due to the lower maintenance cost, it is invariably an investment which from our experience pays for itself in two years.

In requesting quotations, give characterictics of electric current.



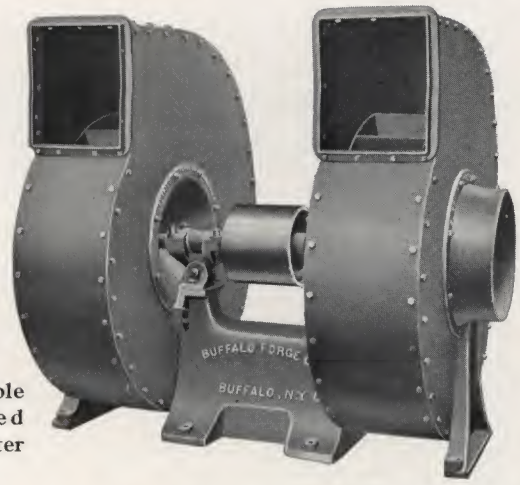
Buffalo Slow Speed Mill Exhauster direct-connected to motor.

Speed and Power Requirements

Single Slow Speed, High Efficiency Mill Exhausters with Different Area Suction Pipes and Varying Velocities.

NOTE. Tables are computed with 200 feet of suction and discharge piping and a collector. The diameter of main discharge pipe is in each instance assumed of same area as the fan outlet. For each additional 10 feet of suction or discharge piping, the speed should be increased approximately one per cent and the power will be increased approximately three per cent. If a collector and elbows are included in the system, the length of pipe to which they are equivalent must be added to the actual length, in order to determine the total equivalent operating length from which speed and power may be figured. (See pages 55 and 57 for further explanation). If the total operating length is less than 200 feet, the speed should be decreased approximately one per cent for each 10 feet and the power will be decreased approximately three per cent. For double fans, power and air handled will be doubled, speeds the same as single fans.

SIZE	Exhauster Inlet Diameter	Exhauster Inlet Area Sq.in.	Exhauster Outlet Size	Exhauster Outlet Area Sq.in.	Suction Branches Area Sq. in.	Suction Branches Equivalent Diameter	VELOCITY THROUGH BRANCH SUCTION PIPES IN FEET PER MINUTE. 2500 Cubic Feet per Minute	2500 R. P. M.	2500 Brake H. P.	3000 Cubic Feet per Minute	3000 R. P. M.	3000 Brake H. P.	3500 Cubic Feet per Minute	3500 R. P. M.	3500 Brake H. P.	4000 Cubic Feet per Minute	4000 R. P. M.	4000 Brake H. P.	4500 Cubic Feet per Minute	4500 R. P. M.	4500 Brake H. P.	5000 Cubic Feet per Minute	5000 R. P. M.	5000 Brake H. P.
30	12½	123	11¾x9⅞	116	79	10	1362	720	.95	1635	863	1.6	1910	1022	2.7	2180	1175	3.9	2450	1300	5.5	2720	1463	7.7
					113	12	1965	826	1.55	2360	989	2.6	2750	1155	4.2	3150	1319	6.3	3540	1485	9.0	3940	1695	16.0
					154	14	2660	990	2.85	3190	1171	4.6	3720	1365	7.6	4250	1552	11.2						
35	14⅜	169	13⅝x11½	157	113	12	1965	612	1.25	2360	724	2.1	2750	850	3.3	3150	970	5.0	3540	1081	7.0	3940	1204	9.7
					154	14	2660	682	1.9	3190	822	3.2	3720	955	5.2	4250	1083	7.8	4790	1215	10.9	5320	1350	15.1
					201	16	3490	781	3.03	4200	935	5.3	4890	1082	8.3	5540	1233	12.2	6280	1470	19.4			
40	16⅝	218	15⅝x13½	203	154	14	2660	514	1.51	3190	620	2.6	3720	721	4.1	4250	824	6.1	4790	927	8.8	5320	1070	12.1
					201	16	3490	576	2.35	4200	683	3.9	4890	806	6.4	5540	911	9.4	6280	1070	13.5	7000	1150	18.6
					254	18	4430	661	3.68	5310	790	6.3	6200	936	10.3	7080	1055	15.1	7980	1200	21.5			
45	18⅝	272	17⅝x14⅝	258	201	16	3490	451	1.9	4200	553	3.2	4890	629	5.2	5540	714	7.7	6280	807	10.9	7000	895	15.1
					254	18	4430	498	2.8	5310	593	4.7	6200	695	7.6	7080	790	11.1	7980	889	16.0	8850	987	22.0
					314	20	5450	555	4.08	6540	664	7.0	7630	777	11.1	8700	888	16.0	9800	1000	23.5	10900	1105	32.5
50	20⅝	335	19½x16⅝	320	254	18	4430	395	2.3	5310	470	3.9	6200	551	6.2	7080	627	9.2	7980	706	13.2	8850	785	17.9
					314	20	5460	434	3.2	6550	526	5.5	7650	606	8.9	8730	690	13.1	9820	775	18.6	10900	860	25.5
					380	22	6600	484	4.6	7920	575	7.9	9250	678	12.6	10578	770	18.5	11890	862	26.5	13200	974	37.0
55	22¾	406	21⅜x18⅜	387	314	20	5460	360	2.8	6550	422	4.6	7650	494	7.3	8730	553	10.5	9820	634	15.6	10900	700	21.2
					380	22	6600	385	3.85	7920	456	6.3	9250	534	10.2	10570	606	14.7	11890	674	21.2	13200	750	29.3
					452	24	7850	430	5.1	9450	512	8.8	11000	606	14.2	12550	672	20.5	14150	772	29.6	15750	856	41.6
60	24¾	480	23⅛x19⅞	460	380	22	6600	337	3.45	7920	384	5.3	9250	437	8.1	10570	509	12.7	11890	573	17.9	13200	641	25.0
					452	24	7850	342	4.0	9450	417	7.1	11000	491	11.5	12500	556	16.9	14150	637	23.4	15750	696	33.5
					531	26	9200	379	5.5	11050	450	9.3	12900	526	14.9	14700	582	20.5	16500	678	31.6	18400	755	43.5
70	28¾	649	27x23	621	531	26	9200	270	4.05	11100	323	6.9	12900	380	11.1	14700	429	16.2	16500	484	23.2	18400	540	32.2
					616	28	10650	285	4.94	12800	351	9.2	14950	408	15.3	17100	454	21.5	19200	522	30.5	21400	582	42.0
					707	30	12250	315	7.0	14700	378	11.9	17100	440	18.8	19600	500	27.7	22100	561	39.5	24500	631	55.0
80	32¾	840	30½x26½	804	707	30	12250	211	4.05	14700	280	8.8	17150	327	14.0	19600	370	20.7	22100	421	29.7	24500	466	41.0
					804	32	13900	250	6.05	16700	296	11.0	19500	347	18.8	22200	394	26.0	25000	446	40.0	27700	495	51.5
					908	34	15750	267	8.2	18900	319	14.0	22100	374	22.2	25200	425	33.5	28300	481	48.0	31500	533	65.5



Buffalo Double Slow Speed Mill Exhauster

Specifications of Buffalo Single Slow Speed Reversible Mill Exhausters.

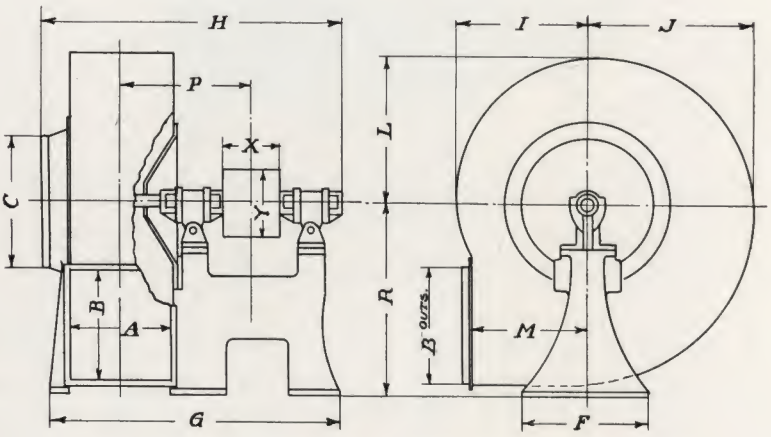
Size Fan	Diameter Inlet	Size Outlet	Maximum Height	PULLEYS		Weight	Price
				Diameter	Face		
30	12½	11¾ x 9⅞	41¾	8	5	425	$ 64.00
35	14⅜	13⅜ x 11½	48¾	9	6	500	80.00
40	16⅜	15⅜ x 13⅛	55	10	7	650	105.00
45	18⅜	17⅜ x 14⅜	62	11	8	1000	135.00
50	20⅜	19½ x 16⅜	69½	12	9	1300	175.00
55	22½	21⅜ x 18⅛	75½	13	10	1600	215.00
60	24½	23⅛ x 19⅞	82½	14	11	1900	230.00
70	28½	27 x 23	96½	16	12	2450	290.00
80	32½	30¾ x 26½	110½	20	14	3000	345.00

Specifications of Buffalo Double Slow Speed Reversible Mill Exhausters.

Size Fan	Diameter Inlet	Size Outlets	Maximum Height	PULLEYS		Weight	Price
				Diameter	Face		
30	12½	11¾ x 9⅞	41¾	8	7½	700	$108.00
35	14⅜	13⅜ x 11½	48¾	9	8½	800	120.00
40	16⅜	15⅜ x 13⅛	55	11	9½	950	160.00
45	18⅜	17⅜ x 14⅜	62	12	10½	1300	210.00
50	20⅜	19½ x 16⅜	69½	13	11½	1600	260.00
55	22½	21⅜ x 18⅛	75½	14	12½	2000	335.00
60	24½	23⅛ x 19⅞	82½	16	15	2500	385.00
70	28½	27 x 23	96½	20	18	3000	480.00
80	32½	30¾ x 26½	110½	24	22	3700	590.00

NOTE. The maximum height as noted is for bottom horizontal discharge. When the housing is swung around for other directions of discharge, this dimension will change (See pages 22 and 23). See suggestions for ordering, page 37.

Buffalo Slow Speed, High Efficiency Mill Exhauster

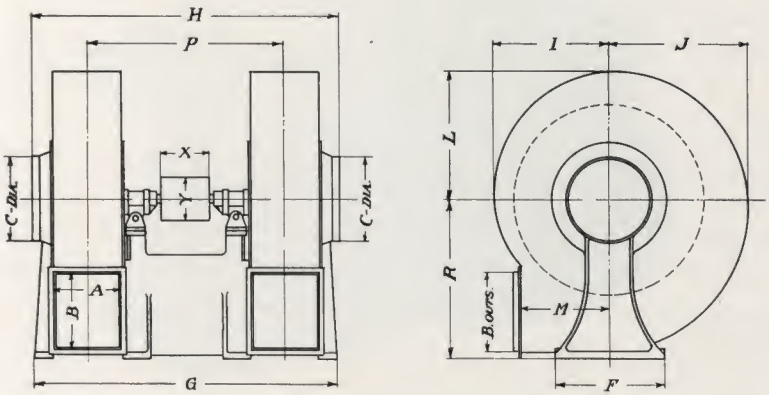


Right Hand Bottom Horizontal Discharge.

DIMENSIONS IN INCHES

SIZE	A	B	C	F	G	H	I	J	L	M	P	R	X	Y
30	9 5/8	11 3/4	12 1/2	12	31 1/4	35	16 3/8	20 3/8	18 3/8	12 1/2	13 7/8	23 3/8	5	8
35	11 1/2	13 3/8	14 3/8	13 3/4	35 1/2	40 3/4	19 1/8	23 7/8	21 1/2	14 1/2	15 1/8	27 1/4	6	9
40	13 1/8	15 5/8	16 3/8	15 3/4	38 3/4	46 5/8	21 3/4	27	24 3/8	16 1/4	17	30 3/8	7	10
45	14 3/8	17 3/8	18 5/8	17 1/2	42	52 1/4	24 1/4	30 1/2	27 1/2	18 1/2	18 7/8	34 1/2	8	11
50	16 3/8	19 1/4	20 3/8	19 3/4	45 1/2	58 1/4	27 3/8	34 1/8	30 3/4	19 1/2	20 3/8	38 1/2	9	12
55	18 1/8	21 3/8	22 1/4	21 1/4	49	64	30	37 1/4	33 3/8	22	22 1/4	41 7/8	10	13
60	19 7/8	23 1/8	24 1/4	24	51 7/8	70	32 3/4	40 3/4	36 3/4	23 3/4	23 3/8	45 3/4	11	14
70	23	27	28 1/4	24	60 3/8	81 1/2	38 1/8	42 3/4	42 3/4	27 3/4	26 1/4	53 1/2	12	16
80	26 1/2	30 3/4	32 1/4	28	66 3/8	93 1/4	43 3/8	49	49	31	29 3/4	61 1/4	14	20

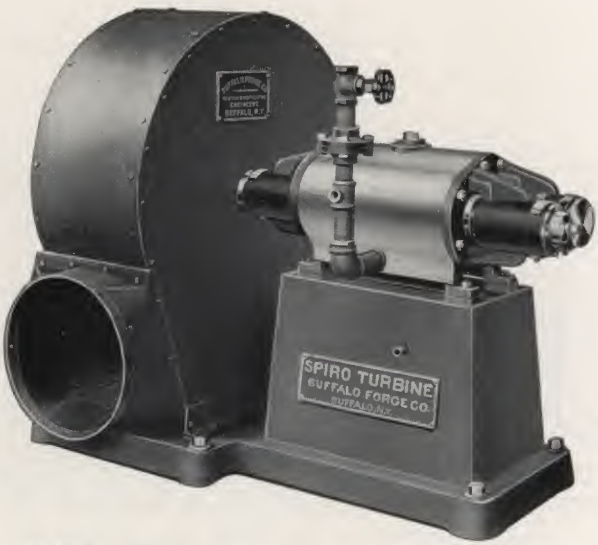
Buffalo Double Slow Speed, High Efficiency Mill Exhauster



Bottom Horizontal Discharge

DIMENSIONS IN INCHES

SIZE	A	B	C	F	G	H	I	J	L	M	P	R	X	Y
30	9⅞	11⅜	12½	12	46¾	48	16⅜	20⅜	18⅜	12½	30½	23⅜	7½	8
35	11½	13⅜	14⅜	13¾	50½	52½	19⅛	23⅞	21½	14½	32⅜	27½	8½	9
40	13⅛	15⅜	16⅜	15¾	58	59	21¾	27	24⅜	16½	37½	30⅜	9½	11
45	14⅜	17⅜	18⅜	17½	64	66	24½	30½	27½	18½	42	34½	10½	12
50	16⅝	19½	20⅜	19¾	69½	71¾	27⅜	34⅛	30¾	19½	45½	38½	11½	13
55	18⅛	21⅜	22½	21½	75½	78¾	30	37½	33⅜	22	49¾	41⅞	12½	14
60	19⅞	23⅛	24½	24	81¾	85½	32¾	40¾	36¾	23¾	54½	45¾	15	16
70	23	27	28¾	24	93½	98½	38⅛	47⅜	42¾	27¾	62	53½	18	20
80	26½	30¾	32¾	28	107	113	43⅜	54⅜	49	31	72½	61½	22	24



Buffalo Mill Exhauster Direct-Connected to Spiro Turbine.

SPECIFICATIONS.

Size of Mill Exhauster	Maximum Revolutions per Minute.	Maximum Pressure in Ounzes.	Capacity Cubic Feet per Minute	Size Spiro	Horsepower	Net Weight Pounds.
30 in.	2100	4	3300	3	7.5	550
35 "	1800	4	4600	4	10.0	750
40 "	1550	4	6000	5	13.0	1250
45 "	1400	4	7700	6	17.0	1800
50 "	1250	4	9500	7	21.0	2400
55 "	1150	4	11500	7	25.0	2600
60 "	1050	4	13800	8	30.0	3200

Buffalo "Spiro" Turbine-Driven Mill Exhauster

Individual turbine drive is found advantageous in many mills where steam is available and engines are already loaded to capacity.

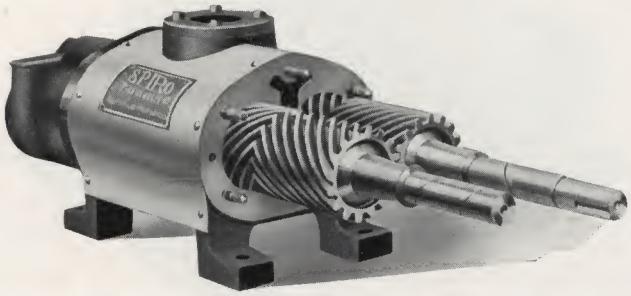
The Buffalo Spiro Turbine is particularly adapted to this work, due to its simplicity and ruggedness of design and the fact that the most efficient turbine speeds correspond with those frequently required for the exhauster.

It is flexible in speed of operation so that if an exhaust system is not giving the proper suction, the trouble can be most easily remedied by simply opening up the throttle.

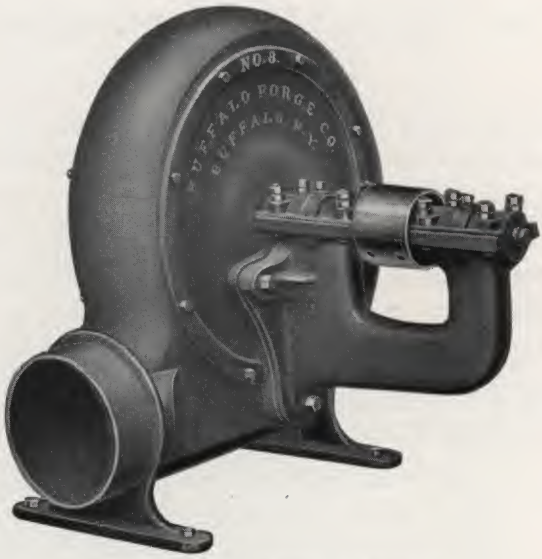
The "Spiro" is ten times smaller than a steam engine of the same capacity, is smaller than an electric motor, and equally silent in operation. It gives steam economies up to 30% better than other turbines, and, unlike the latter, it has no inserted fine blades to come loose or erode. Instead it has rugged teeth, cut in the solid metal.

The steam enters from below, impinges against the teeth, expands in the tooth grooves, and exhausts on top. There are about 80,000 impacts and expansions per minute at regular rotor speed, which accounts for the tremendous power developed in a small space.

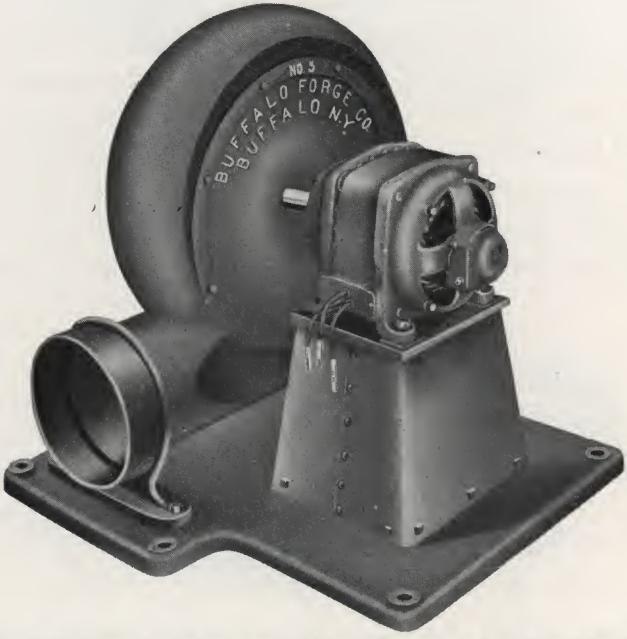
Our catalog No. 225 takes up in detail the design and construction of the Spiro Turbine and its many and varied uses, for instance, for generator sets, centrifugal pumping units and blower equipment.



Spiro turbine with one head removed and rotors pulled half-way out, showing simplicity and compactness of entire construction.



Buffalo "B" Volume Exhauster.



Buffalo "B" Volume Exhauster, Direct-Connected to Electric Motor. Right Hand Bottom Horizontal Discharge.

Buffalo "B" Volume Exhausters

The application of Buffalo "B" Volume Exhausters for the purpose of removing refuse from emery wheels, buffing wheels or machines used in any abrasive process, has been most extensive and satisfactory. Other uses are numerous, and hardly a day passes without seeing a new application for them in some industry. Among the most frequent applications, we might mention forge shop exhaust systems, removal of chemical fumes, small drying systems, induced and forced draft for boilers, and pneumatic conveying systems of all kinds.

Very often it is found desirable to remove shavings or other stringy material from a single machine, and the installation does not then warrant the purchase of a large steel plate fan. A "B" Volume Exhauster with a special non-clogging cone blast wheel will be found inexpensive and efficient in this case.

Construction

These exhausters are built with a solid peripheral shell of heavy cast iron, to which detachable side plates are securely bolted.

A great advantage of this construction, in addition to strength, is the easy access to the interior for the inspection of parts or making repairs. By removing just one of the side plates the blast wheel and shaft can be readily removed. It is unnecessary to dismantle the entire machine.

The blast wheel is of heavy rolled steel plate, mounted upon an iron spider or hub. The vanes are securely riveted, not only to the arms of the spider, but also to the heavy steel flanges.

Each blast wheel is tested for both strength and balance beyond that required. A durable, smooth and easy-running fan is assured. The blast wheel is overhung allowing a single unobstructed inlet.

Cone blast wheels, similar in design to the illustration on page 4 are furnished when it is desired to remove stringy material.

A particularly vital detail about any centrifugal fan is the design of the bearings and the method of supporting them. Buffalo "B" Volume Exhausters have extra long journal bearings of the Buffalo ring-oiling type.

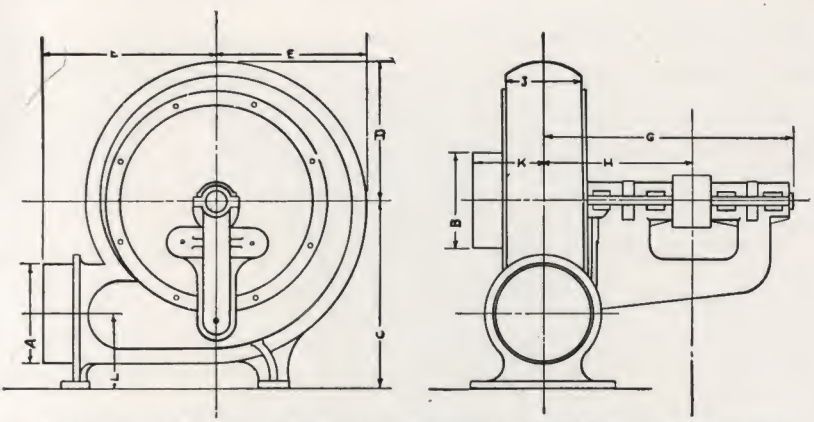
These bearings are particularly suited for use where dust, dirt and grit fill the atmosphere. They require little attention beyond an occasional filling of the oil reservoir.

Exhausters for Gases and Acid Fumes

When acid fumes and gases are to be removed, it is essential to have an exhauster which does not leak. We furnish special equipment with flanged inlet and outlet and stuffing box around shaft for this service. We build this apparatus for both low and high pressure, the latter type for pressures up to 24 ounces. The fans can be belt-driven or direct-connected to steam turbine or motor.

Speeds, Capacities and Horsepower of "B" Volume Exhausters.

No. of Blower	½ Oz.			1 Oz.			2 Oz.		
	R. P. M	Cap.	H. P.	R. P. M.	Cap.	H. P.	R. P. M.	Cap.	H. P.
1	1693	104	.023	2396	148	.074	3393	210	.233
2	1397	264	.059	1976	374	.187	2800	534	.593
3	980	438	.098	1387	621	.310	1965	888	.987
4	859	585	.130	1216	828	.414	1724	1174	1.300
5	776	837	.186	1098	1185	.593	1556	1688	1.870
6	635	1185	.263	898	1677	.839	1274	2382	2.650
7	582	1372	.305	823	1941	.971	1168	2752	3.060
8	499	1986	.440	706	2810	1.405	1001	3983	4.430
9	411	3299	.733	581	4668	2.334	824	6641	7.300
10	349	4488	.997	494	6350	3.175	702	9003	9.900
	3 Oz.			4 Oz.			6 Oz.		
1	4169	258	.382						
2	3437	651	.964	3977	753	1.37			
3	2414	1090	1.615	2794	1261	2.29	3436	1551	3.86
4	2119	1441	2.135	2452	1667	3.03	3015	2051	5.13
5	1912	2071	3.08	2212	2397	4.36	2721	2948	7.37
6	1563	2923	4.33	1809	3382	6.15	2225	4160	10.40
7	1434	3377	5.00	1660	3908	7.10	2041	4806	12.00
8	1229	4888	7.24	1422	5656	10.20	1748	6957	17.40
9	1012	8150	12.10	1171	9431	17.10	1440	11599	28.90
10	861	11050	15.00	966	12786	21.90	1225	15726	37.00



Right-Hand Bottom Horizontal Discharge "B" Volume Exhauster.

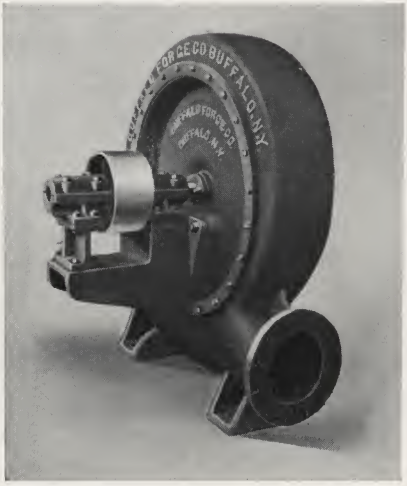
DIMENSIONS

No.	C	D	F	G	H	J	K	L
000	9	5¾	8⅝	11¾	7½	3½	3	3¼
1	9	6⅝	9⅞	10⅞	6⅛	4	3¾	3 9/16
2	11¾	8¾	11½	14½	9½	4⅝	5	4 9/16
3	14	10 15/16	13⅜	18⅛	11⅛	5⅞	5⅜	5⅜
4	15⅝	12 1/16	14 9/16	19⅜	12	6⅜	5½	6
5	18	13⅜	17¼	23¾	14½	7¾	7	6 13/16
6	20⅜	16¾	19⅝	25⅜	15⅜	8⅝	7⅜	7⅜
7	23⅞	18½	22	28	16½	10⅜	8⅝	8 1/16
8	25⅞	21¼	24⅛	30⅜	18½	11⅝	9⅜	9 1/16
9	30⅛	25	28¾	33⅜	20⅜	14⅛	11¾	11
10	38¼	30⅛	31⅜	37⅛	23⅛	18¼	13⅞	14¼
11	42¾	35⅜	46½	.....	.....	22	16¾	17⅛

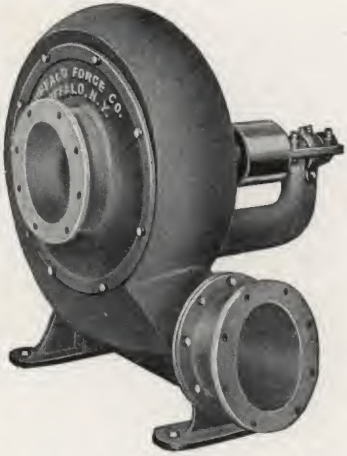
SPECIFICATIONS

No.	Inlet Diameter Outside	Outlet Diameter Outside	Weight	PULLEY		Price
				Diameter	Face	
000	5 1/16	5⅛	45	2¾	2¼	$ 15.00
1	5¾	4⅞	60	3	2½	20.00
2	6 1/16	6 1/16	100	3½	2⅝	25.00
3	7½	7⅜	170	4	3	33.00
4	9	9	200	5	3⅞	44.00
5	10⅜	10⅜	275	5¾	4⅜	55.00
6	12⅛	11 13/16	380	6½	5¼	70.00
7	14	14	575	7½	6¼	90.00
8	16	16⅜	725	8½	7¼	150.00
9	17¼	17⅝	1100	9½	8¼	200.00
10	21	21	1600	12	9¾	250.00
11	24½	24½	3200	14	12	350.00

Special discharges 10 per cent additional. In ordering please specify "B" Volume Blower or Exhauster, in full.



Special acid fan built of non-corrosive metals.



Exhauster or "Booster" with flanged inlet and outlet and stuffing box. For handling gases.

Corrosive acid gases often require exhauster shells constructed of special material, such as hard lead, monel metal, copper or special alloy; and blast wheels of copper, monel metal or other acid resisting metals. Our engineers will gladly make recommendations upon receipt of details.

Direct-connected "B" Volume Exhausters

"B" Volume exhausters direct-connected to motors or Spiro turbines prove extremely satisfactory. The exhauster and motor are mounted on a cast iron bed plate as shown opposite, the motor or turbine being elevated on a sub-base. Quotations will be made promptly upon receipt of information relative to character of electric current.

We also manufacture a complete line of "B" Volume Blowers corresponding in every respect to the exhausters except that the blowers have two inlets and a bearing on each side of the shell. The prices are the same as for exhausters.

"B" Volume Exhauster driven by Spiro Turbine.

Buffalo Dust and Refuse Collector.

Buffalo Dust and Refuse Collectors

THESE collectors or separators are built of heavy galvanized sheet steel, securely riveted and stiffened to meet the strains of the service.

In operation, the air and refuse matter, discharged through the inlet near the top of the collector, is thrown against the side with a whirling motion. The air, thus suddenly admitted into an enlarged area, loses most of its velocity and escapes through the opening in the top. The heavier refuse matter, no longer supported by the velocity of the air, falls through the discharge orifice into the bin or other receptacle provided for it.

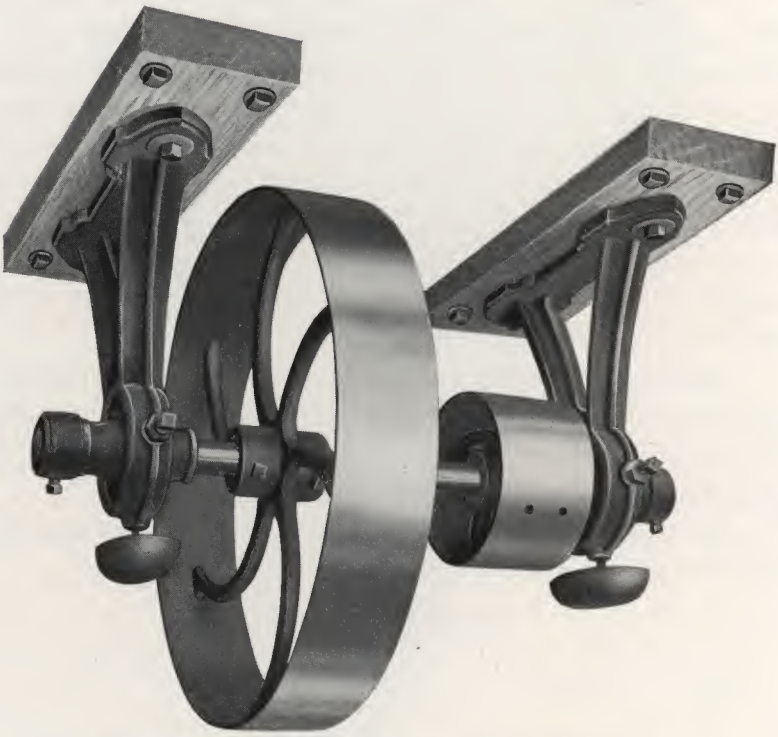
In operation the "Buffalo Collector" imposes but slight back pressure on the fan. It will be less than the equivalent of the velocity in the pipe.

The Buffalo Dust Collector or Cyclone Separator has no equal for separating such material as shavings, sawdust, refuse from tumbling barrels, emery wheels, sanders, etc., from the air by which it is conveyed.

For handling abrasive materials such as emery dust and fine coal, an extra heavily constructed collector is recommended.

SPECIFICATIONS.

Diameter of Inlet	Size of Refuse Outlet	Diameter of Shell	Length of Collector	Price
6	6	24	40	$ 75.00
8	7	32	52	100.00
10	8	40	64	125.00
12	8	48	76	175.00
14	8	56	89	200.00
16	8	64	101	225.00
18	9	72	114	250.00
20	10	80	126	275.00
22	11	88	139	300.00
24	12	96	151	325.00
26	13	104	163	350.00
28	14	112	175	375.00
30	15	120	187	400.00
32	16	128	200	430.00
34	17	136	212	460.00
36	18	144	224	500.00



Buffalo Countershaft with Self-Aligning Bearings.

Buffalo Countershafts

BUFFALO countershafts are substantially designed to transmit the maximum power encountered with the various sizes of exhaust fans.

Each hanger is equipped with adjustment screws, permitting quick and easy adjustment and alignment of the bearings.

The long journal bearings are of babbitt metal, bored and reamed the proper size. The bearings are carried in heavy cast iron journal boxes. This construction gives smooth and easy operation and is particularly suited for use where the air is filled with dust and grit.

SPECIFICATIONS.

Size of Single Exhauster	Diameter of Pulley Driving Exhauster	Diameter of Driven Pulley	Weight	Price	Extra for Tight and Loose Pulleys
30	26	9	200	**$25.00**	**$ 7.50**
35	30	10	300	**30.00**	**8.00**
40	32	12	375	**40.00**	**9.00**
45	36	14	475	**50.00**	**10.00**
50	40	16	600	**65.00**	**13.00**
55	42	18	750	**80.00**	**14.00**
60	44	20	900	**85.00**	**17.00**
70	48	22	1050	**90.00**	**21.00**

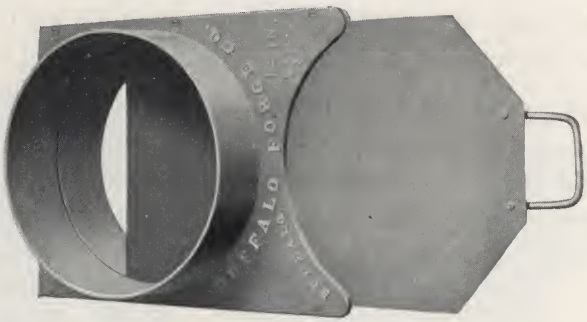
NOTE. Double exhausters require the same pulley ratio as the corresponding size single fan, but the construction must be heavier in order to transmit the additional power. To arrive at cost, take price of single countershaft one size larger.

Buffalo Slide-Pattern Blast Gates

BLAST gates are necessary in every branch outlet of a blow-pipe system. They save handling useless air, thereby reducing the power consumption and increasing the efficiency of the system, since the suction is increased in the remaining branch pipes when those not in use are shut off. It is essential for maximum efficiency that the blast gates be of adequate size in order that minimum resistance may be offered to the passage of the air.

The frames of these gates are of heavy cast iron. The slides are of heavy gauge steel plate.

Buffalo Slide-Pattern Blast Gates



Buffalo Slide-Pattern Blast Gate.

SPECIFICATIONS

Size	Inside Diameter	Axial Length	Weight	Price
2	1⅞	3	1½	$ 1.00
2½	2¼	3½	2	1.25
3	2⅞	4	2½	1.50
4	3⅞	5½	6	2.00
5	4⅞	5¾	7	2.25
6	5¾	7	11	2.50
8	7⅞	8¼	25	3.50
10	9⅞	9	31	5.00
12	11½	9	36	6.50
14	13½	8¼	45	8.00
16	15½	9¾	75	12.00
18	17½	9¼	80	16.00
20	19½	8¼	95	18 00
24	23½	9¾	120	21.00
26	25½	Built up of angle irons and steel plate.	150	70.00
30	29½		205	80.00
36	35½		280	100.00
42	41½		350	120.00
48	47½		460	140.00

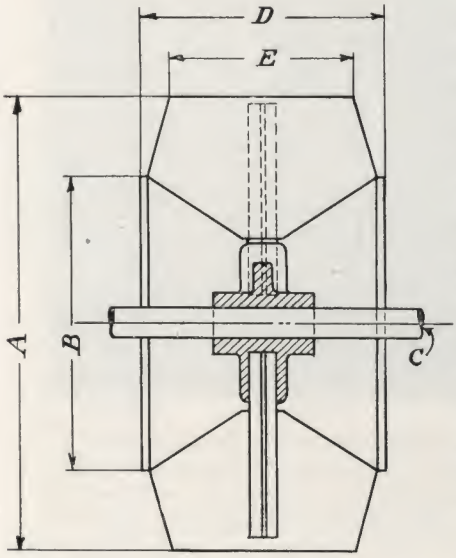
NOTE. The sizes indicate outside diameter of collar of gates over which the pipe fits.

Suggestions to Follow in Ordering

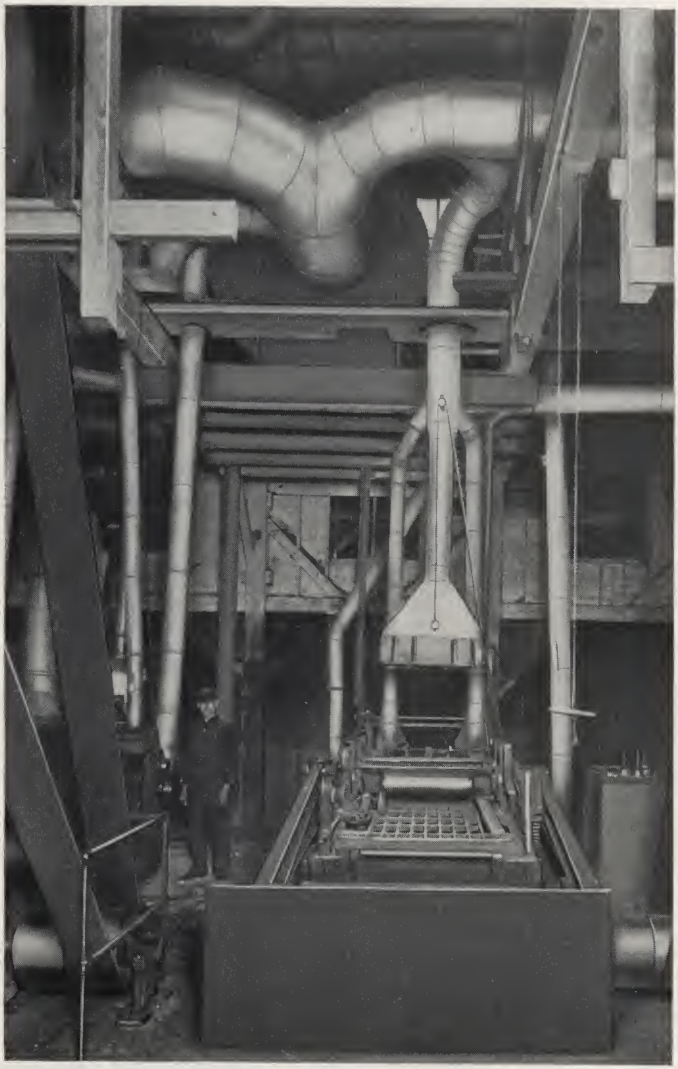
IN ordering a fan, in addition to giving the size, always state the hand and discharge desired. The standard arrangement is right hand, bottom horizontal discharge and if we are not advised otherwise, a fan of this arrangement will be shipped. While the hand and discharge can be changed on Standard Steel Plate Mill Exhausters, the same is not the case with motor or turbine driven units nor with the "B" Volume Exhausters.

The "hand" of the fan is determined by the location of the drive side when one stands facing the outlet of the fan. If the pulley, motor or turbine is on the left, it is called "left hand," if on the right, "right hand". The discharge is designed as "Bottom Horizontal", "Vertical Down," "Up-Blast", or "Top Horizontal" as the case may be.

We request that information relative to the service in which the fan is to be employed be stated in ordering, thus avoiding dissatisfaction due to the purchase of equipment not designed for the work imposed on it.



In ordering a new blast wheel, it is very essential, in addition to informing us of the kind and number of fan, that we know all of the dimensions in connection with the same. See cut for dimensions needed. Also please state the service in which it is to be used, so that we can determine whether the standard wheel or an extra heavy wheel would best meet your requirements. In the diagram, "C" stands for diameter of shaft.



Mill room of the Dodge & Bliss Company, Tonawanda, N.Y. Note 80 inch exhauster direct-connected to motor upon platform. This Buffalo fan replaced a double 80 inch fan of another manufacture. The power consumption was cut in two.

Practical Engineering Data on Blow Pipe Work

IN laying out an exhaust or conveying system, the usual method of procedure is to determine: (1) the number and size of branch pipes necessary to properly do the work; (2) the design and arrangement of piping to give the best results with the least power consumption; (3) the size and most economical type of exhaust fan; and (4) the disposition of refuse.

Pipe Sizes

FROM practical experience, the size of pipes necessary to adequately serve the various wood working machines, emery and buffing wheels, tumbling barrels, etc., has been determined. The following tables give the usual sizes of galvanized iron piping to attach to hoods enclosing the machines. For branch pipes over twenty-five feet long, increase the size ten per cent for each additional twenty feet.

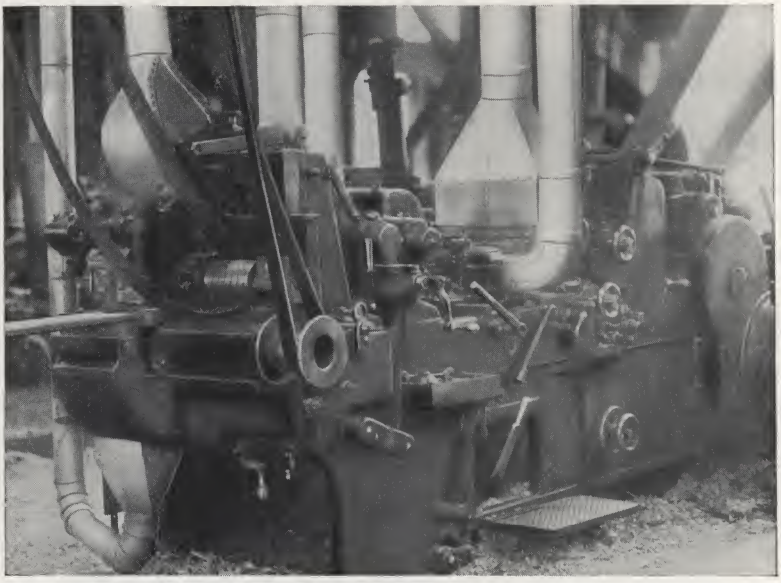
Pipe Sizes for Woodworking Machines.

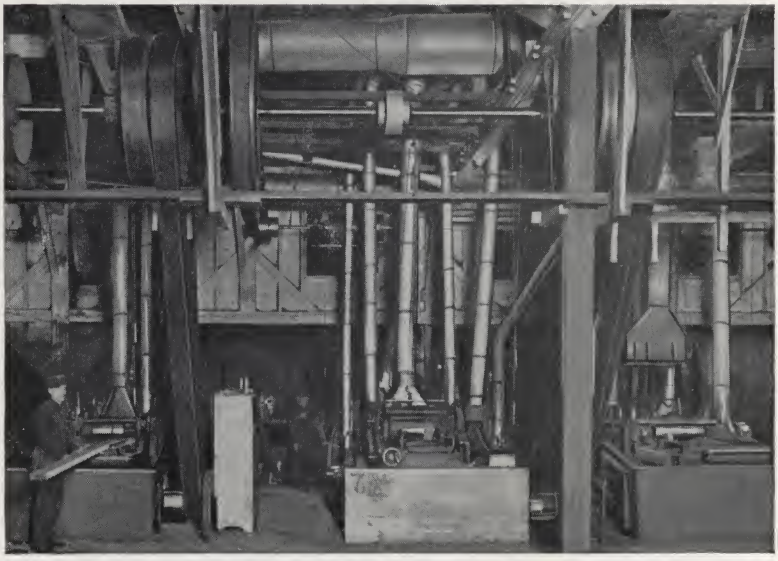
	No of Pipes	Size of Pipes		No. of Pipes	Size of Pipes
Cut-off Saws,			Matcher Heads, each .	1	5
10-16 inch diameter	1	4	Moulder	4	4-7
18-24 inch diameter	1	5	Sash and Cabinet Shaper.	1	4
Rip Saws and Re-Saws,			Door Tenoner	1	5
10-16 inch diameter	1	4	Sash Tenoner . . .	1	4
18-24 inch diameter	1	5	Sticker, each head . .	1	4
24-60 inch diameter	1	6	Panel Raiser, each head.	1	4
Band Saws, small. . .	1	3	Mortiser	1	6
Buzz Planer	1	4-7	Router	1	4
Pony Planer	1	4-7	Jointer	1	4-7
Diagonal Planer . . .	1	4-7	Sand Drum, 24 inch long.	1	4
Four Sided Planer . .	4	4-7	Sand Drum, 30 inch long.	1	5
Bull Planer	2	4-7	Sand Belt	1	4
Planer and Matcher . .	4	4-7	Floor Sweeps	...	6

Sizes of pipes for planers, moulders and similar machines with knives or saws.

UPPER KNIVES		LOWER KNIVES	
Length	Size of Pipe	Length	Size of Pipe
5 inches.	4 inches.	5 inches.	4 inches.
10 "	5 "	10 "	5 "
14 "	6 "	14 "	5 "
24 "	7 "	24 "	6 "
30 "	7 "	30 "	7 "

For Planers handling timber the pipe sizes must be increased 25 per cent. High speed planers and matchers requre about 50 per cent more area than indicated in the above table.





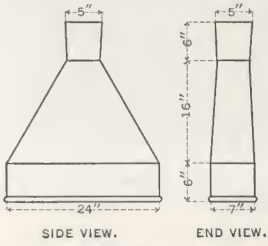
Note construction of hoods and piping layout for large planers and matchers.

Pipe Sizes for Emery Wheel Exhaust Systems.

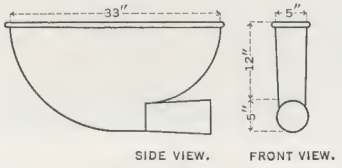
Diameter of Wheel	Size of Pipe	Diameter of Wheel	Size of Pipe
36 inch.	7 inch	20 inch.	4½ inch
30 "	6 "	16 "	4 "
26 "	5 "	12 "	3½ "

Hood Construction

A Few typical hood constructions are shown herein. In designing hoods, a principle to keep in mind is to so shape them that the refuse from knives or wheels, due to their contrifugal action, is thrown directly to a point where it will be caught by the highest velocity of air. Hoods should always be made to fit as tight and close as possible, since the suction effect is lost, resulting in poor operation, if this feature is disregarded.



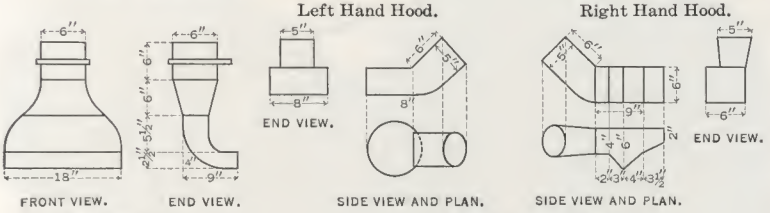
Pony Planer Hood.



Resaw Hopper.

Left Hand Hood.

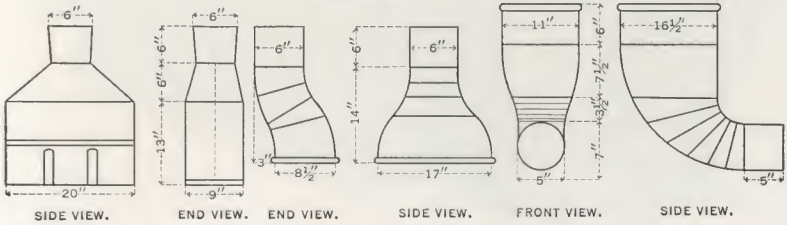
Right Hand Hood.



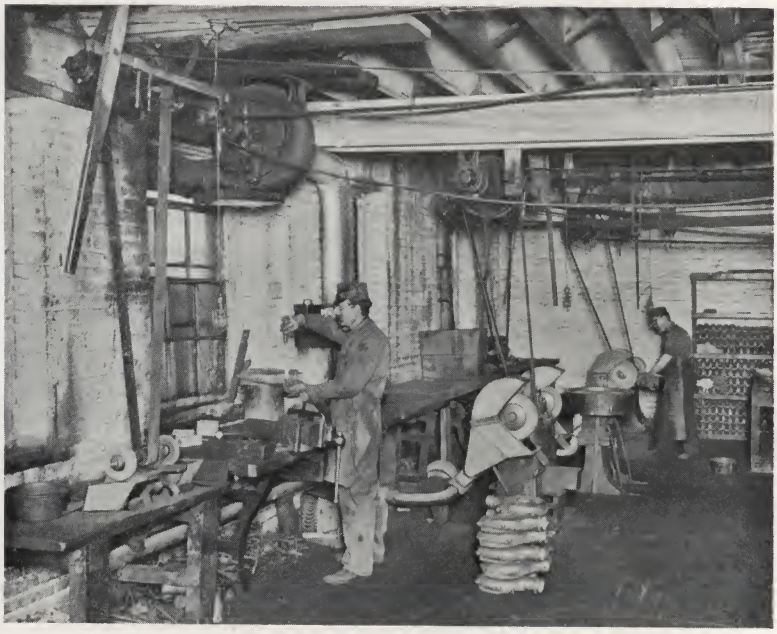
Floor Sweep. **Double Matcher Hoods.**

Upper Hood.

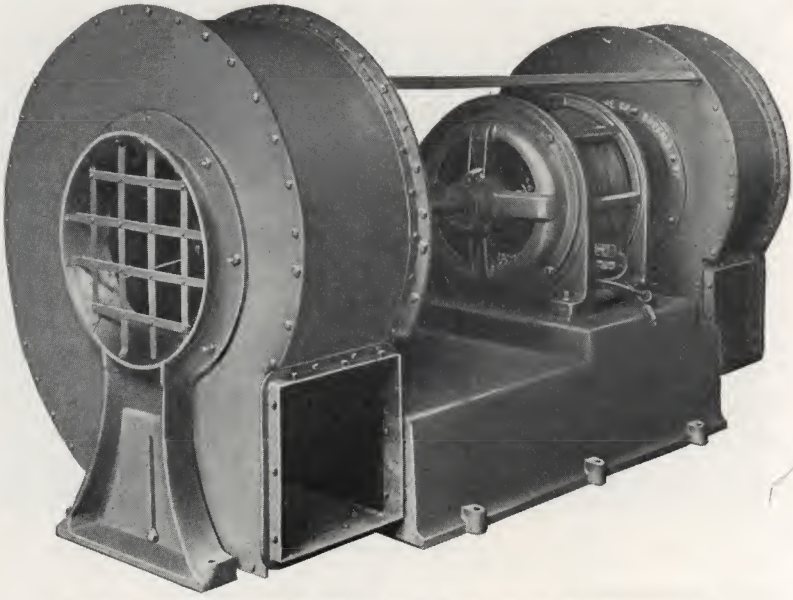
Lower Hood.



Shaping Machine Hood. **Double Matcher Hoods.**



An emery wheel exhaust system. Note "B" Volume Exhauster suspended from ceiling.



Special motor driven double Mill Exhauster for cotton gins.

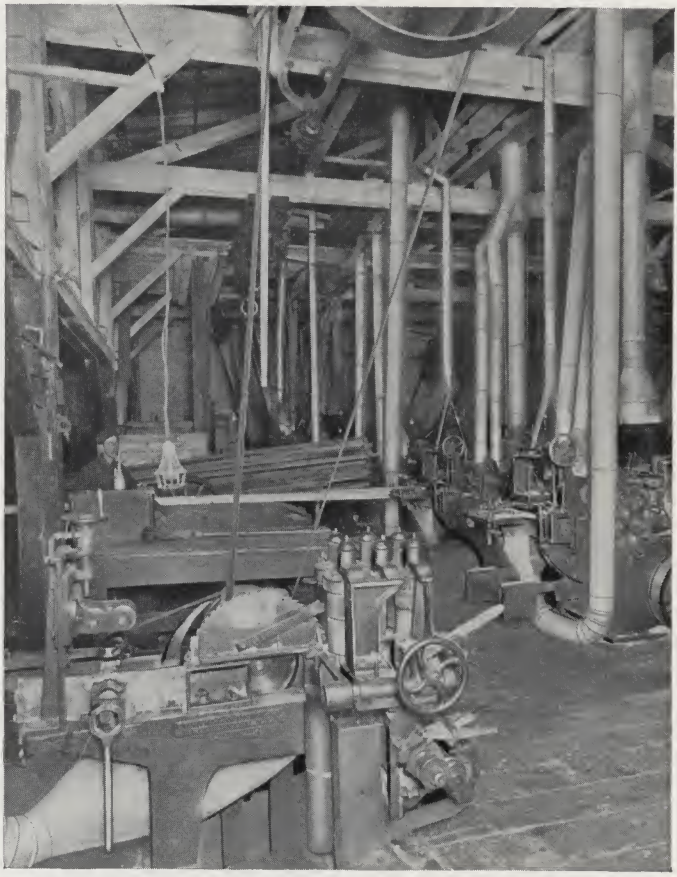
It is almost impossible to give standard practice in hood construction since there is such a variety of makes and sizes of machines as to preclude the possibility of having any standard design. Furthermore, a hood must be constructed to suit the character of the work to be done. For instance, the grinding of some work can be best done on the top of the wheel, while others are more easily ground at the middle or below the center of the wheel.

It is sometimes necessary in the application of fans to the removal of smoke and fumes, to so design the hoods that they will not be in the way of the mechanics and still be capable of catching the noxious gases before they get into the room. Most failures in such installations are due to the pipes being too small.

To determine the diameter of pipe for such hoods, it is good practice to make the mouth of the hood extend out over the kettle or furnace at least six inches in every direction, if the hood is not elevated over 2 feet. For every additional 2 foot elevation, the size of the hood should be increased 6 inches each way.

The area of the branch pipe should then be made one sixteenth of the hood mouth. For instance, a furnace 2 x 4 feet in size, having the bottom of the hood 4 foot above it, would have a hood 4 ft. x 6 ft. and the area of the pipe should be one sixteenth of this or 1.5 square feet. This branch should therefore be 17 inches in diameter. The velocity at the mouth for average conditions should be 100 to 200 feet per minute.

In some manufacturing processes, poisonous and noxious gases have to be removed in a more efficient manner. If one should attempt to exhaust sufficient air through a hood to create enough suction at the mouth to gather in all of these fumes, the size of pipe and air to be handled would often be out of all reason. This can be very satisfactorily avoided by the use of a double hood with about an inch clearance between the outside and inside hood around the edges. The inside hood is then tapered back and the pipe is so connected that sufficient air is drawn up around the edges through the



A battery of planers. Note construction of rip saw hood in foreground.

small area between the inside and outside hood to create a velocity of about 1000 feet per minute in this slot and 75 to 100 feet over central area. A high velocity therefore exists around the edge of the hood and any gases that do not naturally rise up into the central portion, are sucked in before they escape into the room.

Layout of Piping

HAVING determined the number and size of branch pipes, it now becomes necessary to lay out the main suction piping system to the exhaust fan. As few elbows as possible should be used, and each elbow should be so designed and laid out that the minimum resistance is encountered. The curve on page 47 will be found convenient for this purpose.

A velocity of 3600 to 4000 feet per minute is required for woodworking machines. This usually corresponds to operating the exhaust fan at a speed to give approximately three to five ounces of pressure. With this high velocity of flow, the friction in the piping becomes of no little consequence. The problem therefore is to proportion the piping so that a uniform suction is produced in every outlet with minimum friction, consistent with economy of material.

To find the size of main pipes, a practical method is, whenever two branch pipes join, to add their cross-sectional area together and choose a main pipe having an area equal to the sum. The table on page 46, giving areas of circles will be found convenient in these calculations. This process should be continued back to the fan until every branch is taken care of. The diameter of the fan inlet should correspond to the diameter of the main pipe thus found.

Very often low power consumption is of more importance than low first cost. By making the main suction pipes larger than given by this average method, the resistance of the system can be reduced, resulting in lower power consumption.

A Table of Area and Circumference of Circles.

Diameter in Inches	Area		Circumference in Feet	One Side of a Square	Diameter in Inches	Area		Circumference in Feet	One Side of a Square	Diameter in Inches	Area		Circumference in Feet	One Side of a Square
	Square Inches	Square Feet				Square Inches	Square Feet				Square Inches	Square Feet		
1	.7854	.0054	.2618	.8862	35	962.1	6.681	9.163	31.0179	69	3739	25.97	18.06	61.1497
2	3.140	.0218	.5236	1.7724	36	1017.8	7.069	9.425	31.9042	70	3848	26.73	18.33	62.0359
3	7.070	.0491	.7854	2.6587	37	1075.2	7.467	9.686	32.7904	71	3959	27.49	18.59	62.9221
4	12.57	.0873	1.047	3.4549	38	1134.1	7.876	9.948	33.6766	72	4072	28.27	18.85	63.8083
5	19.63	.1364	1.309	4.4311	39	1194.5	8.296	10.21	34.5628	73	4185	29.07	19.11	64.9946
6	28.27	.1964	1.571	5.3174	40	1256.6	8.727	10.47	35.4491	74	4301	29.87	19.37	65.5808
7	38.48	.2673	1.833	6.2036	41	1320.2	9 168	10.73	36.3353	75	4418	30.68	19.63	66.4670
8	50.27	.3491	2.094	7.0898	42	1385.4	9.621	10.99	37.2215	76	4536	31.50	19.90	67.3500
9	63.62	.4418	2.356	7.9760	43	1452.2	10.08	11.26	38.1078	77	4657	32.34	20.16	68.4800
10	78.54	.5454	2.618	8.8623	44	1520.5	10.56	11.52	38.9444	78	4778	33.18	20.42	69.1500
11	95.03	.6600	2.880	9.7485	45	1590.4	11.04	11.78	39.8802	79	4902	34.04	20.68	70.0290
12	113.1	.7854	3.142	10.6347	46	1661.9	11.54	12.04	40.7664	80	5027	34.91	20.94	70.8950
13	132.7	.9218	3.403	11.5209	47	1734.9	12.05	12.30	41.6527	81	5153	35.78	21.21	71.8000
14	153.9	1.069	3.665	12.4072	48	1809.5	12.51	12.57	42.5839	82	5281	36.67	21.47	73.3500
15	176.7	1.227	3.927	13.2934	49	1885.7	13.09	12.83	43.4251	83	5411	37.57	21.73	73.5540
16	201.0	1.396	4.189	14.1796	50	1963.5	13.64	13.09	44.3113	84	5542	38.48	21.99	74.4460
17	226.9	1.576	4.451	15.0659	51	2043	14.19	13.35	45.9760	85	5675	39.41	22.25	75.4785
18	254.4	1.767	4.712	15.9521	52	2124	14.75	13.61	46.0838	86	5809	40.34	22.51	76.2170
19	283.5	1.969	4.974	16.8383	53	2206	15.32	13.88	46.9700	87	5945	41.28	22.78	77.1038
20	314.1	2.182	5.236	17.7245	54	2290	15.90	14.14	47.8562	88	6082	42.24	23.04	77.9871
21	346.3	2.405	5.498	18.6108	55	2376	16.50	14.40	48.7425	89	6221	43.20	23.30	78.8733
22	380.1	2.640	5.760	19.4970	56	2463	17.10	14.66	49.6287	90	6362	44.18	23.56	79.7621
23	415.4	2.885	6.021	20.3832	57	2552	17.72	14.92	50.5149	91	6504	45.17	23.82	80.6473
24	452.3	3.142	6.283	21.2694	58	2642	18.35	15.18	51.4012	92	6648	46.16	24.09	81.5389
25	490.8	3.409	6.545	22.1557	59	2734	18.99	15.45	52.2874	93	6793	47.17	24.35	82.4196
26	530.9	3.687	6.807	23.0419	60	2827	19.63	15.71	53.1736	94	6940	48.19	24.61	83.3060
27	572.5	3.976	7.069	23.9281	61	2922	20.29	15.97	54.0598	95	7088	49.22	24.87	84.1902
28	615.7	4.276	7.330	24.8144	62	3019	20.97	16.23	54.9061	96	7238	50.27	25.13	85.0760
29	660.5	4.587	7.592	25.7006	63	3117	21.65	16.49	55.8323	97	7390	51.32	25.39	85.9650
30	706.8	4.909	7.854	26.5868	64	3217	22.34	16.76	56.7185	98	7543	52.38	25.66	86.8500
31	754.7	5.241	8.116	27.4730	65	3318	23.04	17.02	57.6047	99	7698	53.46	25.92	87.7380
32	804.2	5.585	8.378	28.3594	66	3421	23.76	17.28	58.4910	100	7855	54.54	26.18	88.6280
33	855.3	5.940	8.639	29.2455	67	3526	24.48	17.54	59.3772					
34	907.9	6.305	8.901	30.1317	68	3632	25.22	17.80	60.2634					

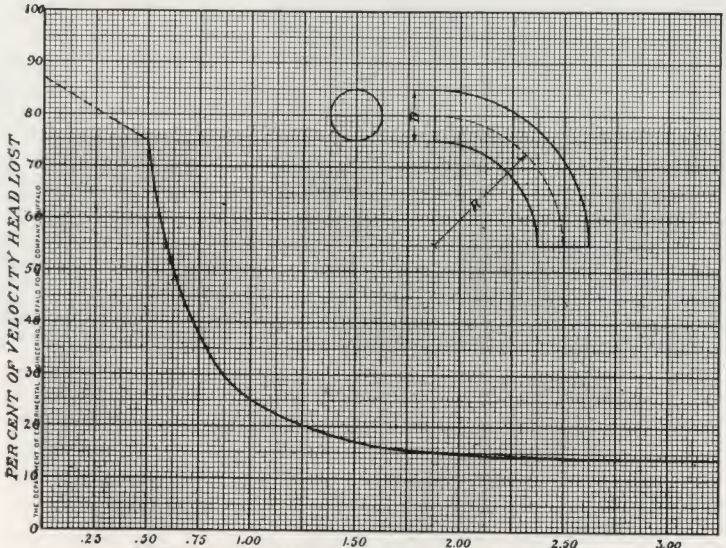
Determination of Friction

THE expression for the flow of air in smooth circular metal pipes may be taken as approximately

$$F = \frac{l}{55d}\left(\frac{V}{5273}\right)^2$$

where "F" is loss of pressure in ounces, "V" is the velocity in feet per minute, "l" is the length of the pipe in feet, "d" is the diameter of pipe in feet, i. e. $\frac{l}{d}$ = length of the pipe in diameters.

From this formula, 55 diameters of the smooth pipe produce a loss corresponding to the velocity head. This is of the same general form as developed by Weisbach but the results of recent experiments have shown his coefficients to be considerably too high for well rounded, smooth pipe and in this formula it has been corrected accordingly. In a 12 inch pipe 55 feet long or a 24 inch pipe 110 feet long, the loss in pressure will therefore correspond to the velocity. For instance, 4000 velocity will cause a loss in pressure of .576 ounce or approximately one inch water gauge every fifty five diameters. The table on page 50 will give full information of pressure losses at other velocities.



LOSS OF PRESSURE IN ELBOWS.

Telescopic hood on Pony Planer. Note floor sweep in foreground.

Elbow friction has been very carefully studied by our engineers and the original results of their experiments are shown by curve on preceding page. It is generally supposed that the more gradual the sweep, the less the friction. This is an erroneous impression and there really are no advantageous results obtained from making elbow radii over 1.5 to 2.0 times the diameter of the pipe. As an example illustrating the practical use of the curve, assume a 12-inch pipe with an 18-inch radius to the center of the pipe or in other words a center line radius 1½ times the pipe diameter. The friction loss corresponding is 0.17 of a velocity head. This result is for smooth, well rounded elbows. In general, when figuring friction losses, an elbow is considered to be equivalent to 10 diameters of pipe.

What Size Fan to Use

A Fan should be chosen having an inlet the same diameter as the main suction pipe. No saving in power results from using a fan a size or two larger than the main duct. The speed may be a little slower, but in a properly designed fan the efficiency is best when operating up to full capacity, not at 50 to 75 per cent capacity as is the case when using a larger fan.

Whether a system warrants a slow speed, high efficiency fan or simply a standard fan can be determined from the cost of power. If economy of power means no saving, as for example in some mills where machines are driven from a countershaft operated by a steam engine, with plenty of power to spare, the standard fan should no doubt be used. In most modern mills, however, power is a big consideration and should be reckoned with. Furthermore, the extra wear and tear of high speed operation is to be considered. Buffalo high efficiency fans save at least 15% in power (sometimes as much as 50%) and operate at a speed one third slower than the standard exhaust fans. The additional initial cost is an excellent investment in almost every instance.

When long shavings or stringy material are to be handled, the special non-clogging cone wheels should always be used. When bulky materials are conveyed, extra heavy fans are essential.

Corresponding Pressures and Velocities of Dry Air at 70° and 29.92″ Barometer.

Inches of Water	Ounces per Square Inch.	Velocity Feet per Minute.	Inches of Water.	Ounces per Square Inch.	Velocity Feet per Minute.
.05	.0289	896	4.77	2.750	8745
.10	.0577	1266	5.00	2.884	8943
.20	.1154	1791	5.20	3.000	9134
.25	.1443	2003	5.50	3.172	9392
.30	.1730	2193	6.00	3.460	9810
.40	.2308	2533	6.07	3.500	9864
.43	.2500	2637	6.50	3.749	10210
.50	.2884	2832	6.94	4.000	10545
.60	.3460	3102	7.00	4.037	10595
.70	.4037	3351	7.50	4.326	10968
.75	.4326	3468	7.80	4.500	11187
.80	.4614	3582	8.00	4.614	11328
.87	.5000	3729	8.67	5.000	11792
.90	.5190	3800	9.00	5.190	12015
1.00	.5768	4005	9.54	5.500	12367
1.25	.7209	4478	10.00	5.768	12665
1.30	.7500	4566	10.40	6.000	12915
1.50	.8650	4905	11.00	6.344	13282
1.73	1.0000	5273	11.27	6.500	13445
1.75	1.0092	5298	12.00	6.921	13875
2.00	1.1535	5664	12.14	7.000	13950
2.17	1.2500	5895	13.00	7.497	14440
2.25	1.2975	6007	13.87	8.000	14913
2.50	1.4418	6332	14.00	8.074	14985
2.60	1.5000	6457	15.00	8.650	15510
2.75	1.5860	6641	15.61	9.000	15820
3.00	1.7300	6937	16.00	9.227	16020
3.03	1.7500	6976	17.00	9.805	16513
3.25	1.8740	7220	17.34	10.000	16675
3.47	2.0000	7457	18.00	10.380	16990
3.50	2.0185	7492	19.00	10.960	17456
3.75	2.1630	7756	19.07	11.000	17488
3.90	2.2500	7910	20.00	11.535	17910
4.00	2.3070	8010	20.81	12.000	18265
4.25	2.4510	8256	22.54	13.000	19012
4.34	2.5000	8337	24.28	14.000	19730
4.50	2.5950	8496	26.01	15.000	20420
4.75	2.7395	8729	27.74	16.000	21090

How to Determine Proper Operating Speed and Power Required for Exhauster

IN the past a great majority of the exhaust fans that have been installed, have at the outset been operated at speeds corresponding to three or four ounces of pressure, irrespective of length of runs, work to be done, or power used. If results showed that this was not sufficient, the speed would be increased. This crude method answered the purpose, but with the growing popularity of direct connected electric units (the speed of which cannot be so easily changed), and the increasing interest which manufacturers show in eliminating power waste, the correct method of determining the best operating speed of an exhauster should be known by every one interested.

Primarily, the speed depends upon the velocity or suction pressure to be maintained at the hoods. To move shavings and saw dust, 3600 to 4000 feet velocity is the average requirement, which corresponds approximately to seven-eighths or one inch pressure (see table page 50). The velocity head of a planing mill system is therefore, as a rule, one inch. To move emery dust, certain suctions are required by different state laws (see pages 60 and 61), but two inches is usually sufficient. In addition to creating this velocity head at the hoods, the operating pressure at the fan must be sufficient to overcome the friction losses of the system. Piping friction loss, plus collector loss, plus intake and discharge loss, plus pressure due to velocity, therefore equals the necessary operating pressure of the exhauster.

As an example, take a planing mill installation having three 7 inch branch pipes, three 6 inch branch pipes, two 5 inch branch pipes and one 4 inch branch. Suppose that the longest run of piping on the suction side of the fan is 57 feet and that there are three right angle elbows in the same (radius of elbows 2 diameters). Suppose that the fan discharges its refuse into a collector located 60 feet from the fan and that there is one right angle elbow in this pipe.

Adding up the areas of the branch pipes, the diameter of the main suction pipe will be 18 inches. Referring to the data on friction losses, the loss in 55 diameters of pipe equals one velocity head.

57 feet of suction and 60 feet of discharge piping ($1\frac{1}{2}$ foot diameter) is equivalent to

$$\frac{57 + 60}{1\frac{1}{2}} = 78 \text{ diameters.}$$

Speed and Power Requirements

Buffalo Single Standard Mill Exhausters.

SIZE	1 Oz.			2 Oz.			3 Oz.		
	R. P. M	Cap.	H. P.	R. P. M.	Cap.	H. P.	R. P. M.	Cap.	H. P.
30	1025	1650	.90	1450	2340	2.55	1775	2850	4.65
35	890	2300	1.25	1260	3250	3.53	1540	3975	6.48
40	770	3000	1.63	1090	4250	4.60	1334	5190	8.40
45	690	3825	2.08	976	5410	5.95	1195	6620	10.78
50	622	4750	2.58	880	6720	7.28	1078	8220	13.38
55	570	5750	3.12	806	8120	8.83	987	9950	16.25
60	520	6900	3.75	735	9750	10.60	900	11950	19.50
70	450	9400	5.10	637	13300	14.50	780	16300	26.60
80	390	12200	6.63	552	17280	18.75	676	21200	34.50
	4 Oz.			5 Oz.			6 Oz.		
30	2050	3300	7.20	2290	3680	10.05	2510	4040	13.32
35	1780	4600	10.00	1990	5140	13.92	2180	5630	18.35
40	1540	6000	13.00	1722	6700	18.15	1888	7350	23.85
45	1380	7650	16.60	1542	8550	23.20	1690	9350	30.40
50	1245	9500	20.60	1391	10600	28.80	1525	11620	37 90
55	1140	11500	25.00	1275	12850	34.90	1398	14080	45.80
60	1040	13800	30.00	1162	15400	41.90	1273	16900	55.00
70	900	18800	40.90	1005	21000	56.90	1100	23000	75.00
80	780	24400	53.00	872	27300	74.00	956	29850	97.20

Buffalo Single Slow Speed, High Efficiency Exhausters.

SIZE	1 OZ.			2 OZ.			3 OZ.		
	R. P. M.	Cap.	H. P.	R. P. M.	Cap.	H. P.	R. P. M.	Cap.	H. P.
30	640	1650	.75	906	2340	2.12	1110	2850	3.87
35	552	2300	1.04	781	3250	2.94	958	3975	5.40
40	482	3000	1.36	682	4250	3.83	837	5190	7.00
45	428	3825	1.73	605	5410	4.96	742	6620	8.97
50	385	4750	2.15	544	6720	6.06	667	8220	11.10
55	350	5750	2.60	494	8120	7.35	606	9950	13.50
60	321	6900	3.12	453	9750	8.83	556	11950	16.20
70	275	9400	4.25	387	13300	12.10	477	16300	22.10
80	241	12200	5.52	341	17280	15.60	418	21200	28.70
	4 OZ.			5 OZ.			6 OZ.		
30	1280	3300	6.00	1428	3680	8.37	1570	4040	11.10
35	1100	4600	8.32	1230	5140	11.59	1350	5630	15.25
40	965	6000	10.80	1075	6700	15.10	1180	7350	19.84
45	855	7650	13.80	955	8550	19.3	1050	9350	25.30
50	769	9500	17.12	860	10600	24.0	942	11620	31.50
55	698	11500	20.80	782	12850	32.8	856	14080	38.10
60	641	13800	25.00	718	15400	39.1	786	16900	45.80
70	550	18800	34.10	613	21000	47.3	674	23000	62.40
80	482	24400	44.20	570	27300	61.7	590	29550	81.00

Four elbows, each considered equivalent to 10 diameters of pipe, equals 40 diameters

$$\frac{78 + 40}{55} = \quad 2.15 \text{ velocity heads.}$$

Intake and discharge loss = 1.50 velocity heads.
Loss in refuse collector = 1.0 velocity head.
Pressure due to velocity = 1.0 velocity head.
Total operating head = 5.65 velocity heads.

Assume 4000 feet velocity required, which corresponds to a pressure of one inch of 0.5768 ounces per square inch (see page 50).

Necessary operating pressure of exhauster =
5.65 x 0.5768 = 3.25 ounces.

From the capacity tables on the opposite page, an exhauster having an 18 inch diameter inlet, or the 45 inch size, should be used. If a slow speed exhauster were chosen, we would find that for 3 ounces pressure the necessary speed would be 742 R. P. M., and the power required 8.97 H. P. But as the pressure required is 3.25 ounces, the accompanying conditions must be calculated from the above factors. That is, the speed will be $742 \sqrt{\frac{3.25}{3.00}} = 770$ R. P. M.

the power will be $8.97 \sqrt{\left(\frac{3.25}{3.00}\right)^3} = 10.10$ H. P.

If a standard exhauster is used, the speed will be 1245 R. P. M. and the power 12.15 H. P.

The power as stated would be maximum, that is, the amount required when all the branch pipes are open. In pattern shops, all of the machines are seldom used at once. This means that less air is handled with resultant reduction in power.

The capacity tables upon pages 10 and 20 which have been compiled with velocity as a basis, will be found more convenient in computing speed and powers than the above method and for most installations will be sufficiently accurate. Assuming the same conditions as in the preceding problem, an example of their use follows:—

Weight Per Lineal Foot for Galvanized Iron Pipes

U. S. Standard Gauge

Diameter of Pipe	Square Feet Per Running Foot.	NUMBER OF GAUGE.				
		24	22	20	18	16
4	1.13	**1.47**	1.69	1.97	2.56	3.10
5	1.39	**1.80**	2.08	2.43	3.19	3.82
6	1.65	**2.14**	2.47	2.89	3.79	4.54
7	1.91	**2.48**	2.86	3.34	4.39	5.25
8	2.18	**2.83**	3.27	3.81	5.01	6.00
9	2.44	3.17	**3.66**	4.27	5.61	6.71
10	2.70	3.51	**4.05**	4.72	6.21	7.42
11	2.96	3.85	**4.44**	5.18	6.80	8.14
12	3.22	4.18	**4.83**	5.63	7.40	8.85
13	3.48	4.52	**5.22**	6.09	8.00	9.57
14	3.74	4.86	**5.61**	6.54	8.60	10.28
15	4.01	5.21	6.01	**7.01**	9.22	10.86
16	4.27	5.55	6.40	**7.47**	9.82	11.74
17	4.53	5.85	6.79	**7.92**	10.42	12.45
18	4.87	6.33	7.30	**8.51**	11.18	13.36
19	5.14	6.68	7.71	**9.00**	11.80	14.11
20	5.40	7.02	8.10	**9.45**	12.42	14.85
21	5.59	7.26	8.39	9.78	**12.85**	15.36
22	5.92	7.70	8.88	10.35	**13.60**	16.25
23	6.18	8.04	9.27	10.81	**14.40**	17.00
24	6.45	8.38	9.67	11.30	**14.84**	17.71
25	6.71	8.72	10.06	11.74	**15.41**	18.41
26	6.97	9.05	10.45	12.20	**16.00**	19.15
27	7.33	9.40	10.85	12.67	**16.62**	19.87
28	7.5	9.75	11.27	13.13	**17.26**	20.60
29	7.75	10.07	11.63	13.58	**17.81**	21.30
30	8.10	10.54	12.17	14.20	**18.62**	22.25
31	8.36	10.87	12.54	14.63	19.20	**23.00**
32	8.62	11.20	12.93	15.10	19.84	**23.70**
33	8.88	11.56	13.34	15.56	20.42	**24.40**
34	9.15	11.90	13.73	16.00	21.08	**25.18**
35	9.41	12.23	14.10	16.48	21.65	**25.85**
36	9.67	12.57	14.50	16.91	22.22	**26 60**
37	9.93	12.91	14.90	17.40	22.84	**27.30**
38	10.19	13.25	15.29	17.81	23.40	**28.00**
39	10.46	13.60	15.60	18.31	24.02	**28.70**
40	10.72	13.95	16.08	18.76	24.68	**29.50**
41	10.98	14.27	16.47	19.20	25.25	**30.20**
42	11.24	14.60	16.86	19.61	25.86	**30 90**
43	11.59	15.06	17.38	20.30	26.60	**31.80**
44	11.85	15.40	17.78	20.74	27.25	**32.60**
45	12.11	15.75	18.17	21.20	27.90	**33.30**
46	12.37	16.10	18.55	21.62	28.43	**34 00**
47	12.63	16.40	18.95	22.10	29.00	**34.70**
48	12.90	16.78	19.35	22.60	29.70	**35.50**
WEIGHT PER SQUARE FOOT.		1.30	1.50	1.75	2.30	2.70

WEIGHTS IN POUNDS (AVDP.) PER RUNNING FOOT.

The proper gauges for the average blow pipe work are indicated in black face type.

Length of suction and discharge pipe.....117 feet.

Length of pipe equivalent to four elbows equals
4 x 10 = 40 diameters
40 diameters x $1\frac{1}{2}$ = ...60 feet.
Total equivalent length = ...177 feet.

The tables are based on 200 feet of suction and discharge piping and a collector, hence a correction for 23 feet will be necessary. For each difference of 10 feet, the speed must be decreased one percent, or two per cent in this instance, and the power three times two or 6 per cent in this instance.

From tables, pages 10 and 20, the following is obtained:

Slow Speed Exhauster—Speed 790 x 0.98 = 774 R. P. M.
Power 11.1 x 0.94 = 10.45 H. P.

Standard Exhauster —Speed 1295 x 0.98 = 1268 R. P. M.
Power 13.3 x 0.94 = 12.5 H. P.

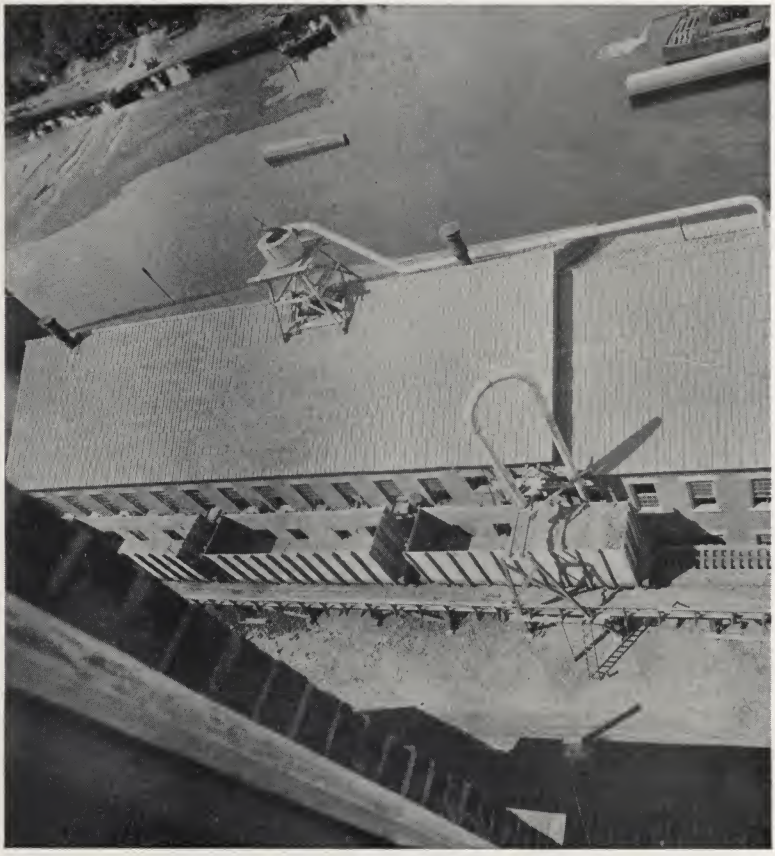
These capacity tables will also be found convenient in determining power requirements when a fan is used with inlet larger or smaller in area than the sum of the areas of the branch pipes.

For examples, suppose that in the mill chosen as an illustration, a larger fan and main duct are installed to provide for future additional machines; for instance, a 50 inch exhauster with 20 inch suction and discharge pipe. The branch pipes for the present machines being the same as before, it will be seen from tables pages 10 and 20, that the speed and power requirements are as follows:

50 inch Slow Speed Exhauster—Speed 627 x 0.98= 615 R.P.M.
(18 inch Equivalent Diameter of Branches.) Power 9.2 x 0.94=8.65 B. H.P.

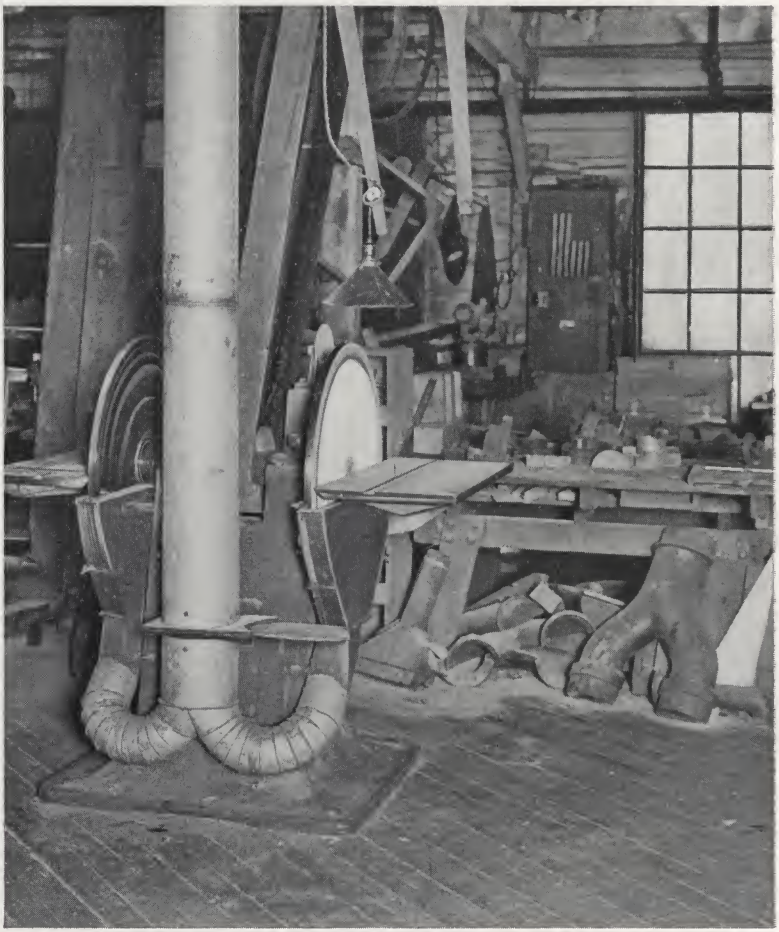
50 inch Standard Exhauster —Speed 1028 x 0.98=1007 R.P.M.
(18 inch Equivalent Diameter of Branches.) Power 11 x 0.94=10.35 B. H. P.

The fact that power is less than for the 45 inch exhausters is due to the decreased friction of the 20 inch main duct as compared with the 18 inch duct, which permits a lower speed and pressure, but, of course, with an increased cost of installation.



A real bird's eye view. Marathon Paper Mills, Wausau, Wisconsin. Showing refuse collector on roof located over boiler room. This system conveys refuse from barkers—an extremely severe service.

Boiler Room, Marathon Paper Mills, Wausau, Wisconsin, showing piping for distributing refuse to boilers. This system replaced the drag conveyor shown near the eaves of the roof. Note the character of the refuse handled.



Hood construction for disc sanders.

Collection of Refuse.

TO properly complete a system, the refuse should be collected in a "Buffalo" centrifugal refuse collector. The outlet of the fan is connected to the inlet of the collector. The diameter of the inlet to the collector should be approximately the same size or a little larger than the main discharge pipe. When very light materials are to be collected, it is good practice to choose a collector with an air outlet so large that the velocity is reduced to a point where it does not carry even the lightest dust with it. The back pressure in a properly constructed collector is usually a little less than the pressure corresponding to the velocity in the pipe.

"Kinks" that may sometimes be used to Advantage

IN large exhaust systems where say 50 to 100 emery wheels are to be served, it very often happens that an exceedingly cumbersome installation results if the customary procedure is followed. The main suction pipe and collector take up too much room, not to mention the high first cost and the excessive distance which the material must be conveyed. It is advisable under such conditions to "relay" the system, that is, divide the machines up into convenient sections and take care of each section separately with a fan and collector. The refuse from the several collectors may be carried over to a final collector by means of a separate exhauster, or the refuse from the first collector discharged into the inlet of the second fan and so on until this refuse material is all relayed and collected.

In planing mill systems where a double fan is used, the first cost upon the piping can often be saved by discharging the refuse from one fan into a relay collector so arranged that this refuse drops into the inlet pipe of the other fan. The air, being handled by one fan, is thus unloaded and the size of the long discharge pipe to the main collector can be reduced about one half.

Our engineers are experts in fan engineering and blow pipe work. Whenever their experience may be of assistance to you, we will be pleased to aid you in every way possible.

Exhaust Systems as Required By Law

PRACTICALLY all dust exhaust systems, acid removal systems, etc., that are installed now must comply with state law requirements. Some states have enacted very good laws covering such installations but the majority of such laws are vague and general.

The states of Ohio, Michigan, Wisconsin, and Illinois have practically identical requirements, as an example of which an extract from the Ohio Statutes Ec. 1027 follows:

"They shall provide each emery wheel with a sheet or cast iron hood or hopper of such form and so applied to it that the dust or refuse therefrom will fall from such wheels or will be thrown into such hood or hopper by centrifugal force and be carried off by the current of air into a suction pipe attached to such hood or hopper.

They shall provide an emery wheel six inches or less in diameter with a three inch suction pipe, an emery wheel six inches to twenty-four inches in diameter with a four inch suction pipe; an emery wheel twenty-four inches to thirty-six inches in diameter with a five inch suction pipe and every emery wheel larger than those provided for with a suction pipe not less than six inches in diameter. Such suction pipe shall be full sized to the main trunk suction pipe, and the main suction pipe to which smaller pipes are attached shall be equal in its diameter and capacity to the combined area of the smaller pipes atached to it. The discharge pipe from the exhaust fan connected with pipe or pipes shall be as large or larger than the suction pipe.

They shall provide necessary fans or blowers connected with suction pipes, which shall be run at a rate of speed sufficient to produce a velocity of air in such suction or discharge pipes of at least nine thousand feet per minute to an equivalent suction, or pressure of air equal to raising a volume of water not less than five inches in a U shaped tube. All branch suction pipes must enter the main pipe at an angle of forty-five degrees or less; the main suction or trunk pipe shall be below the emery or buffing wheels and as close to them as possible and be either upon the floor or beneath the floor on which the machinery to which such wheels are attached are placed. All bends, turns or elbows in such suction pipes must be made with easy smooth surfaces having a radius in the throat of not less than two diameters of the pipe on which they are connected.

Nothing in this section regarding blowers, hoods, hoppers, or suction pipes shall apply to emery wheels upon which water is used at the point of the grinding contact, small emery wheels used temporarily for tool grinding or small shops employing not more than one man at work upon an emery wheel, which does not create dust enough in the opinion of the chief inspector of workshops and factories or a district inspector to be injurious to its operator. No female shall be employed in operating, assisting to operate, or using any of the wheels or belts specified in the preceding four subdivisions of this section."

The following extract from a paper read at a meeting of the International Association of Factory Inspectors by an Illinois inspector, shows the interpretation placed on the Illinois State law by those charged with its enforcement:

"I will now show you how our method of testing the quality, quantity and velocity of air in shops equipped with exhaust systems is. On entering a shop to make an inspection under the Blower Law we first test the amount of pressure in the suction pipes. For this purpose we use the U shaped tube filling the tube with water to zero. We remove the hood and place a cardboard over the opening of the branch pipe. Through this card we insert the rubber pipe connecting with the tube and get our reading. The law reads: "It shall be the duty of any person, company or corporation operating any such factory or workshop to provide the necessary fans and blowers to be connected with such pipes as above set forth, which shall be run at a rate of speed as will produce a velocity of air in such suction or discharge pipes of at least 9,000 feet per minute to an equivalent suction or pressure of air equal to raising a column of water 5 inches in a U shaped tube."

Now as a matter of fact, a pressure of air that would raise a column of water 5 inches in a U shaped tube would be equivalent to a velocity of 12665 feet per minute. The law should read, "to an equivalent suction or pressure of air equal to a displacement of a column of water 5 inches in a U shaped tube." This means 2½ inches up and 2½ inches down. If the pressure is equal to the requirement of the law the rest of the system is generally alright. If it falls below the standard then we proceed to ascertain the cause of the trouble. We measure the diameter of the branch and main pipe and see if the system has been properly constructed. Sometimes we find that additional pipes have been added without increasing the size of the main pipe or the fan capacity.

In other cases we find by applying the speed indicator that the fan is not turning fast enough. Sometimes this is caused by a loose belt but too often it is caused by a desire to save power bills. If no fault is found in the fan we turn our attention to the exhaust pipe and make a test for back pressure. This is done by puncturing the pipe with a center punch and applying the U shaped tube. If the back pressure indicated is more than ½ inch it is excessive and due to some defect in the collector or to clogged pipes."

From our experience, five inches pressure is too much to require. An excessive amount of power is used with no particular advantage. Two inches suction pressure at the hoods (see page 54 for corresponding velocity) gives satisfactory results and several of the state factory bureaus, notably New Jersey, New York and Missouri, recognizing the merits of this, have revised their laws accordingly.

The new legislation in Missouri as proposed reads :—

"Section 7839. That all persons, firms or corporations operating any mechanical establishment, factory, mill, foundry or workshop, or operating any machine where emery, corundum, sand, alundum, carborundum, crystolon, or other abrasive wheels, drums, disks, rolls, or belts of any description are used, either solid, leather covered, felt, canvas, linen, paper, cotton, or wheels or belts rolled or coated with emery, corundum, sand, alundum, carborundum, crystolon, or other abrasives used for grinding or buffing, or any tumbling barrels or rattlers, vats or tanks, or machines of any character, which generate dust, smoke, fumes or poisonous or noxious gases in their operation shall provide each and every wheel, * * * vat or tank with a hood or similar apparatus which shall be placed over, beside or underneath such wheels, * * * in such a manner as to protect the person or persons using or working about the same from inhaling the dust, smoke, fumes or gases arising from or thrown off by such wheels, * * * while in operation by conveying same by mechanical exhaust directly to a dust collector, air washer or to some receptacle placed so as to receive and confine such dust, smoke, fumes or gases. * * *

Section 7840. It shall be the duty of any person, firm or corporation operating such mechanical establishment, factory, mill, foundry or workshop, to provide or construct such appliances, apparatus, machinery or other things necessary to carry out the purpose of this act, as set forth in the preceding section, as follows: Each and every such wheel, drum, disk, roll, belt, machine, tumbling barrel or rattler, vat or tank shall be fitted with a casing hood or hopper of such form and so applied to such wheel, drum, disk, roll, belt, machine, tumbling barrel, or rattler, vat or tank, that the dust, smoke fumes or gases therefrom will fall from such wheels, drums, disks, rolls, belts, machines, tumbling barrel or rattler, vat or tank, or will be thrown into such casing, hood or hopper, or arise and be carried off by the current of air into a suction pipe attached to same casing, hood or hopper; said suction pipes to connect with an exhaust fan.

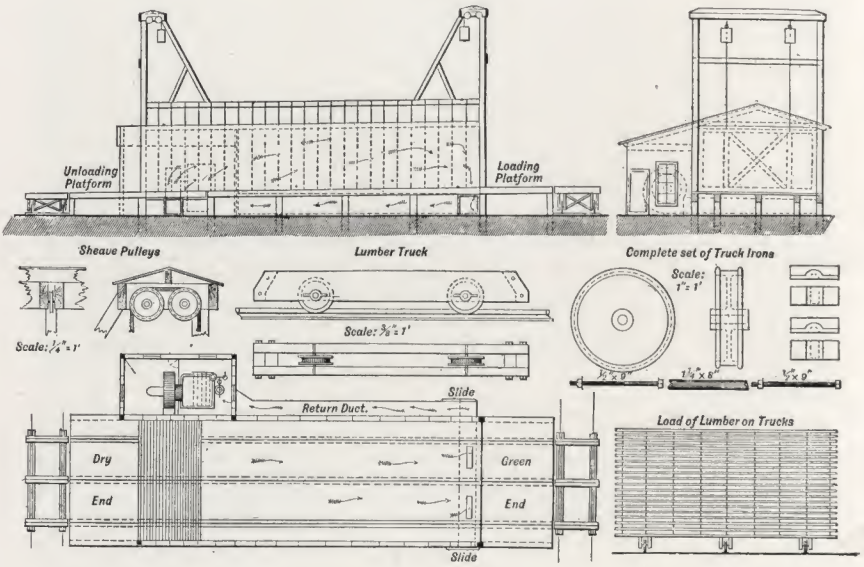
Section 7840a. Each and every such wheel six inches or less in diameter shall be provided with a three inch suction pipe; wheels above six inches in diameter, and not to exceed sixteen inches in diameter shall be provided with a four inch suction pipe; wheels above sixteen inches in diameter, and not to exceed twenty-four inches in diameter, shall be provided with a five inch suction pipe; all wheels more than twenty-four inches in diameter shall be provided with a six inch suction pipe. The area of the pipes exhausting from all such drums, disks, rolls, belts or machines, shall equal the unobstructed area of the opening in hood or hopper on such drum, disk, roll, belt, or machines; said opening in hood or hopper shall be ample and so placed so as to collect the dust, smoke, fumes or gases generated by said drums, disks, rolls, belts, or machines. The exhaust pipes from hoods covering vats or tanks shall have an area sufficient as compared to the unobstructed opening in hood so as not to reduce the velocity of air through opening to less than four hundred feet per minute; such hoods shall equal in area the opening of vats or tanks, and the area of opening in hood shall be at least one-sixteenth the area of exposed liquid surface in tank or vat. The exhaust pipes from all tumbling barrels and rattlers shall be not less than five inches in diameter. The suction pipe from each hood so specified must be full size to the main trunk suction pipe, and the main suction pipe to which smaller pipes are attached shall, in its area and capacity, be not less than the combined area and capacity of all such branch pipes attached to same; the main trunk suction pipe shall be proportionately reduced in size and area beyond each succeeding connecting branch pipe in an amount equal to the size and areas of said branch, and the discharge pipe from exhaust fan, connected with such suction pipe or pipes, shall be as large or larger than the suction pipe.

Sec. 7840b. It shall be the duty of any person, firm or corporation operating any such mechanical establishment, factory, mill, foundry or workshop. to provide the necessary fan or exhauster to be connected with such pipe or pipes, as set forth in the preceding section. The inlet of said fan or exhauster shall be not less in area than the main trunk line and said fan shall be run at a rate of speed as will maintain sufficient suction head in each branch pipe within fifteen inches of the hoods to raise a minimum of two inches of water column in a U shaped tube; pressure to be taken by pressing tube attachment over small opening through pipe (commonly called static method). Test to be made with all branches open and unobstructed. All branch pipes must enter the main trunk pipe at an angle of forty-five degrees or less, and the main suction or trunk pipe shall be as close to the hoods as possible. All bends, turns or elbows in such pipe or pipes must be made with easy, smooth surfaces, having a radius in the throat of not less than two diameters of the pipe on which they are connected."

In Massachusetts, Washington, Oregon, Colorado, Pennsylvania, Indiana, Minnesota, Maine, Iowa and possibly other states, the law requires the installation of fans for the removal of dust and noxious gases but contains no definite standard to be maintained.

A system installed in accordance with suggestions as given in our "Practical Engineering Data on Blow Pipe Work" will meet the requirements of any state. The speed of operation of the fan will be different in different localities, however, due to varying requirements in different states. Such information must, of necessity, be obtained from the Bureau of Factory Inspection of the state in which the installation is to be made.

Buffalo Progressive Lumber Dry Kiln



STANDARD SIZES.

	Size of Dry Kiln		Size of Apparatus House, In Feet	Holding Capacity of Kiln	For Two Tracks in Kiln — Number of					For Three Tracks in Kiln — Number of					No. of Sheave Pulleys	Wire Rope, in Feet	Size of Fan, in Inches	Feet Fan System Heater
	No. of Drying Rooms	Size of Each Room, In Feet			Lumber Trucks	Truck Wheels and Spindles	Half Boxes	Bolts and Nuts with Washers	12-lb. T Rails, in Feet	Lumber Trucks	Truck Wheels and Spindles	Half Boxes	Bolts and Nuts with Washers	12-lb. T Rails, in Feet				
Single Kiln	One	15 x 17 x 9	12 x 8	8000	8	16	32	32	84	12	24	48	48	96	8	85	40	553
	"	22 x 17 x 9	12 x 8	12000	10	20	40	40	84	15	30	60	60	126	8	85	50	1108
	"	27 x 17 x 9	13 x 8	16000	12	24	48	48	126	18	36	72	72	140	8	85	60	1385
	"	33 x 17 x 9	13 x 8	20000	14	28	56	56	138	21	42	84	84	169	8	85	60	1585
	"	43 x 17 x 9	13 x 8	24000	16	32	64	64	150	24	48	96	96	189	8	85	70	1980
	"	64 x 17 x 9	14 x 10	36000	22	44	96	96	166	33	66	132	132	252	8	85	80	2730
	"	85 x 17 x 9	15 x 10	50000	28	56	128	128	210	42	84	168	168	315	8	85	90	2990
Double Kiln	Two	22 x 17 x 9	13 x 8	24000	20	40	80	80	164	30	60	120	120	252	16	170	70	1980
	"	43 x 17 x 9	14 x 9	50000	32	64	128	128	252	48	96	192	192	378	16	170	80	2730
	"	64 x 17 x 9	15 x 10	75000	44	88	176	176	336	66	132	264	264	504	16	170	90	3270
	"	85 x 17 x 9	17 x 12	100000	56	112	224	224	420	84	168	336	336	630	16	170	110	4860
Triple Kiln	Three	22 x 17 x 9	14 x 9	36000	30	60	120	120	252	45	90	180	180	378	24	255	80	2730
	"	43 x 17 x 9	15 x 10	75000	48	96	192	192	373	72	144	288	288	576	24	255	90	3270
	"	64 x 17 x 9	17 x 12	110000	66	132	264	264	500	99	198	396	396	756	24	255	110	4860
	"	85 x 17 x 9	20 x 14	150000	84	168	336	336	625	126	252	504	504	940	24	255	120	6350
Quadruple Kiln	Four	22 x 17 x 9	14 x 9	48000	40	80	160	160	336	60	120	240	240	504	32	340	90	3270
	"	43 x 17 x 9	17 x 12	96000	64	128	256	256	504	96	192	384	384	672	32	340	110	4860
	"	64 x 17 x 9	20 x 14	144000	88	176	352	352	672	132	264	528	528	1008	32	340	120	5960
	"	85 x 17 x 9	22 x 26	192000	112	224	448	448	840	168	336	672	672	1260	32	340	140	8030
	Five	85 x 17 x 9	24 x 20	240000	140	280	560	560	1050	210	420	804	804	1575	40	425	2—120	9020
	Six	85 x 17 x 9	26 x 22	300000	168	336	672	672	1260	252	504	1008	1008	1890	48	510	2—130	10340
	Eight	85 x 17 x 9	32 x 26	400000	224	448	896	896	1680	336	672	1344	1344	2520	64	680	2—140	12700
	Ten	85 x 17 x 9	36 x 28	500000	280	560	1120	1120	2100	420	840	1680	1680	3150	80	850	3—150	16640

Buffalo Fan System Lumber Dry Kilns

IT is understood to be a fact that a plentiful circulation of air is just as necessary as the application of heat in the proper drying of lumber and other material. The underlying principle of fan system heating is the conveyance of heat units by means of air. It is therefore admirably adapted to drying, since one operation and one apparatus provide the features conducive to best results, namely heat and plenty of air.

In Buffalo Progressive Driers, the material is loaded in at one end of the building, gradually moved forward in the kiln as the drying progresses and finally removed from the other end, dried and seasoned. When two or three kinds of lumber in various shapes and sizes are to be handled, two or three kiln rooms are recomended, since by regulation of dampers, provided for the purpose, any desired temperature can be maintained in any apartment without reference to each other.

Buffalo Progressive Kilns are designed to dry lumber from the inside out, not to place a hard crust on the material, leaving the core wet and soggy. The hottest air direct from the apparatus, comes in contact with the dryest lumber first. The air then passes back through the kiln, meeting the greener material as it progresses, until finally it comes in contact with the lumber just put in the kiln. The hot air in this journey is continually absorbing moisture from the material, which increases its humidity with a resulting decrease in temperature. The kiln is so designed that this air is very nearly saturated with moisture at the green end of the kiln, since a high humidity is valuable in opening up the pores and softening the outside of the lumber, so that the inside moisture can find its way to the surface.

On page 62, is given a table of sizes of progressive driers for average practice, To be sure of best results however, we would suggest that all drying problems be submitted to our engineers for

consideration. Scarcely two installations would receive precisely the the same treatment. Little observation is needed to see that hard timber like oak, ash, hickory, maple, etc. differ materially in the arrangement of their cells and tissues from the soft timbers, such as pine, cypress, hemlock, etc. The true foundation of all drying calculations is based on a thorough knowledge of the effect of the heat and humidity in the air on the material to be handled, Our experience has been very extensive in every kind of drying and no concern has made a more exhaustive study of the subject.

Buffalo Fan System apparatus, properly applied to operate with ordinary or home-made kilns, with steam pipes in the bottom, will very materially increase their capacity and evenness of drying. We will be very pleased to give you more definite information as to just what results can be accomplished upon receipt of complete details.